DOCUMENT RESUME

ED 059 864 SE 012 298

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TITLE Teacher Competencies and Characteristics in a Science Preservice Teacher Education Project.
PUB DATE 72
NOTE 252p.; Ph.D. dissertation, Ohio State University

EDRS PRICE MF-$0.65 HC-$9.87
DESCRIPTORS *Doctoral Theses; Educational Research; Evaluation; *Preservice Education; Program Descriptions; *Secondary School Science; *Student Teaching; Teacher Characteristics; *Teacher Education

ABSTRACT

Selected outcomes of two preservice teacher education programs in secondary school (7-12) science education at The Ohio State University were assessed. The project program emphasized classroom participation in urban and suburban schools prior to student teaching by enrollment in the first professional quarter (S1) immediately preceding student teaching (N=48) or in the (S2) student teaching quarter (N=46). The other program (non-project) consisted of student teaching (N=46). There were four criterion variables: (1) the preservice teachers' views of activities which should be used for science instruction in urban or suburban settings; (2) the activities the student teachers used for instruction; (3) the preservice teachers' attitudes toward and knowledge of culturally deprived students; and (4) the student teachers' personal adjustment and student-teacher relations. These conclusions were indicated: project students had higher mean scores (significant difference) on criteria (2) and (4); only the project (S1) students significantly changed their views about the type of activities which should be used in urban and suburban classes and retained or gained on these measures upon the completion of student teaching; and neither group changed significantly in attitudes toward or knowledge of culturally deprived students. (Author/PR)

TEACHER COMPETENCIES AND CHARACTERISTICS IN A SCIENCE PRESERVICE TEACHER EDUCATION PROJECT

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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* * * * *

The Ohio State University

1972

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ABSTRACT

TEACHER COMPETENCIES AND CHARACTERISTICS IN A SCIENCE PRESERVICE TEACHER EDUCATION PROJECT

By

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The Ohio State University, 1972

Professor Robert W. Howe, Adviser

Selected outcomes of two preservice teacher education programs in secondary (7 - 12) school science education at The Ohio State University were assessed. One program (project) emphasized classroom participation in urban and suburban schools prior to student teaching. The project preservice teachers were enrolled in the first professional quarter (S_1) immediately preceding student teaching (N=48) or in the (S_2) student teaching quarter (N=46). The other program (non-project) consisted of student teaching (N=46). Each student teacher taught in one school. This study evaluated the second group of college students who participated in the two quarter senior project sequence.

The criterion variables were the preservice teachers' views of activities which should be used for science instruction in urban or suburban settings, the activities the student teachers used for instruction, the preservice

teachers' attitudes toward and knowledge of culturally deprived students and the student teachers' personal adjustment and student-teacher relations. The relationships of selected preservice teacher, cooperating teacher, and classroom student variables to selected outcomes were also examined.

The instruments used were the Science Classroom Activity Checklist: Teacher's Perceptions (SCACL:TP), in both urban and suburban contexts, the Science Classroom Activity Checklist: Student's Perceptions (SCACL:SP), the Cultural Attitude Inventory (CAI), the Checklist for Assessment of Science Teachers: Supervisor's Perceptions (CAST:SP), and the Checklist for Assessment of Science Teachers: Pupil's Perceptions (CAST:PP). Descriptive and attitudinal information were collected using personnel records and questionnaires.

The SCACL:TP and the CAI were administered to S_1 preservice teachers during the first and last weeks of the S_1 quarter. S_1 posttest scores were used as S_2 pretests for the project student teachers.

Pretest and posttest data were collected from both project and non-project student teachers. Cooperating teachers and university supervisors completed measures near the end of the student teaching quarter. Classroom students provided input in terms of their regular (cooperating) teachers near the beginning of the student teaching quarter and in

terms of their student teachers near the end of the same quarter.

The major conclusions are: (1) Project and non-project student teachers differed significantly in terms of the types of science classroom activities which they used for their instruction and in terms of their student-teacher relations. The project group had higher mean scores than the non-project group. (2) Preservice S_1 teachers changed their views significantly about the types of science classroom activities which should be used in urban or suburban classrooms at the completion of the S_1 quarter. This group retained their gains on these measures as assessed at the completion of the S_2 quarter. The project group did not change significantly in their attitudes toward or knowledge of culturally deprived students in either of the two quarters of their program. (3) The non-project groups did not change significantly in their views of the types of science classroom activities which should be used for science instruction in urban or suburban classrooms or in their attitudes toward or knowledge of culturally deprived students. (4) Cooperating teachers who perceived their facilities as being adequate and who used course content improvement project materials were rated high by their classroom students on the SCACL:SP or on the CAST:PP. These relationships provide criteria that should be employed in the selection of schools and cooperating teachers for preservice teacher placement.

Recommendations for program adjustments, for kinds of problems to be researched, and for methodologies are presented. Appendixed are copies of the CAST, a description of the Senior Project Program, and a categorization of cooperating teachers by SCACL:SP and CAST:PP scores and by their assessments of their facilities and materials.

ACKNOWLEDGMENTS

I wish to express my appreciation to the following persons for their guidance and assistance with this study.

Betty and Missy, my wife and daughter; Dr. Robert W. Howe, my major advisor; Dr. Fred R. Schlessinger, Dr. Paul R. Klohr, and Dr. C. Benjamin Meleca, members of my committee; Dr. Richard L. Sagness, University of South Dakota; and the personnel of the following school systems: Bexley, Canal Winchester, Catholic Schools of Columbus, Columbus, Gahanna, Hamilton Township, Mifflin, Reynoldsburg, Scioto-Darby, South-Western, Upper Arlington, Westerville, Whitehall, and Worthington.

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Howe, Robert, Brown, William R., et.al., Life Science for Seventh Grade (First Experimental Edition), Educational Research Council of America, Cleveland, Ohio, 1967. Published as Rasmussen, et.al., Man and the Environment, Houghton Mifflin, 1971.

Brown, William R., "EPIC...An Innovative Curricular Model," The Science Teacher, Vol. 37, No. 2, February, 1970.

FIELDS OF STUDY

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CHAPTER I

INTRODUCTION AND GENERAL OVERVIEW OF THE STUDY

Introduction

The preparation of teachers of science for the secondary schools of the United States is primarily a function of universities and colleges. This preparation typically includes campus based course work in academic areas and in professional education. A component of the professional education sequence is an opportunity to apply the theoretical aspects of education to the test of reality. The student teaching experience provides an opportunity for the preservice teacher to work with classroom students. Cooperating teachers who are employed by the public schools and university supervisors work with the student teacher during this experience.

Teachers utilize numerous classroom activities in their instructional roles. Certain of these have been found to be more effective in the implementation of the objectives of the several curriculum improvement projects in the science disciplines. Methods courses, which precede student teaching in a conventional pattern of preservice teacher training,

provide opportunities for the preservice teacher to examine classroom activities. The application of these activities to classroom students is typically postponed until the student teaching experience.

Specific methods courses and the student teaching experience are not the only variables which influence preservice teacher competencies. The personal characteristics of the preservice teacher are hypothesized to be influential. What are the teacher's attitudes toward and knowledge of certain students or social classes of students and how will his attitudes and knowledge influence his teaching?

Does the availability of classroom facilities have an effect on preservice teacher competencies? A detailed assessment of the availability of facilities was not included in this study; however, studies by Brewington (1971) and Cignetti (1971) indicate that facilities may be influential in the types of activities used by first year inservice science teachers.

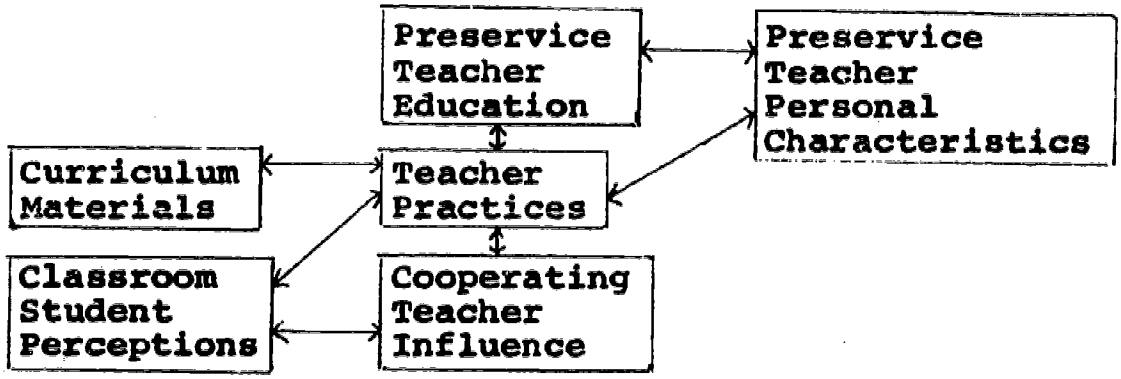
How do students perceive their teacher, the materials, and the classroom activities used by their teacher? Although teachers may indicate that they use certain classroom activities, student perceptions may provide valuable information as to what a teacher actually does in the classroom.

The experiences of preservice science teachers should result in the development of individuals equipped with a sound philosophical framework and a multitude of methodo-

logical skills. Variables such as the preservice teacher's personal characteristics may influence his style; this influence may be assessed by obtaining feedback from the preservice teacher, from his supervisors, and from his classroom students.

Sagness has proposed a model based on a model postulated by Kochendorfer (1966). Kochendorfer represented the relationships between three major factors, curriculum materials, teacher practices, and student programs, involved in bringing about the desired objectives of most science curriculum projects. Sagness added the dimensions of preservice and inservice teacher education to the Kochendorfer model.

An extension of the Sagness model reflects the major concerns of this study. Two elements added to the model were: (1) selected preservice teacher personal characteristics such as his attitude toward certain categories of students and his personal adjustment, and (2) the influences of the cooperating teacher on the student teacher's activities.



Sagness has discussed the realization of the need for inservice education by developers of the science curriculum projects. He also pointed out that there apparently has not been the necessary emphasis in preservice teacher education programs to develop teachers with both the methodological skills and philosophical framework necessary to positively implement the course content improvement projects. The "new" science materials are widely disseminated in the public secondary schools, but how are they being used?

In addition to what is to be taught and how it is to be presented, the concern of where the teaching is to occur should be examined. Science is part of the curriculum in urban (inner city) schools, in suburban (outer city) schools, as well as in rural schools. Can teacher education institutions prepare teachers with the background and flexibility to function effectively in any environmental setting?

The Teacher Education Project in Science and Mathematics Education at The Ohio State University is attempting to equip preservice teachers with the necessary philosophical framework and methodological skills to implement positively the contemporary objectives of science and mathematics education. This project is striving to prepare teachers who can function in widely varying environmental situations.

The science education component of the program consists of a five quarter (two year) sequence that emphasizes active participation of preservice teachers in various classroom,

school, and community experiences. The last two quarters occur in the preservice teacher's senior year. Experiences during the two quarter sequence occur in both urban and suburban environmental settings. Participation involves various teaching competencies. These activities are supplemented by seminars where sociologists, school administrators, psychologists, and other community and university personnel relate theory and practice. Descriptions of the two quarter Senior Project sequence in Science Education at The Ohio State University are provided in Appendix F.

During the 1970-71 academic year a "traditional" science education program was operated concurrently with the Senior Project sequence. This conventional program also was oriented toward the development of a philosophical framework and a set of methodological skills, but it did not provide specific experiences directed toward early in-school participation or toward preparation for instruction in different environmental settings. Sagness has described the non-project science teacher education program at The Ohio State University (Sagness, 1970).

Importance Of The Study

During a time when the demand for large numbers of science teachers has decreased, emphasis is being shifted to the development of "quality" programs and "quality" teachers. The assessment of program outcomes is essential in order to

provide data upon which decisions for program changes may be based.

Since 1970-71 was the last year during which both the conventional and project sequences were offered at The Ohio State University, a final opportunity to compare two different types of programs existed.

The Sagness study of 1969-70 explored numerous variables hypothesized to be pertinent to the operation and assessment of preservice science teacher programs. This study followed the lead provided by Sagness and reduced and further analyzed variables associated with the two preservice teacher education programs. Adjustments in project operations may be based on data collected on large numbers of preservice teachers over a two-year period.

An important outcome of a science teacher education program is the nature of the classroom activities used for instruction. It is also desirable to know the preservice teacher's attitude toward the nature of science activities which should be used for instruction in different environmental settings as he progresses through a teacher education program. The assessment of other variables, such as the effect of the cooperating teacher, the effect of the environmental setting, and the effect of the materials used for instruction should be incorporated in order to provide data for decision making. Data from classroom students, cooperating teachers, university supervisors, and the

preservice teachers themselves provide extensive input or perceptions from persons involved in pr ervice education.

Statement of The Problem

The problems were the following:

Problem 1. To compare the influence, in terms of criterion variables, of two science education programs for preservice science teachers.

Problem 2. To investigate the interrelationships of selected variables with the criterion variables.

Hypotheses

The hypotheses are grouped by program quarter, problem number, and program classification (where applicable). If no significant change occurs in terms of criterion variables for Problem 1, the hypotheses will not be rejected and the hypotheses listed for Problem 2 pertaining to the same criterion variables will not be pursued. Interrelationships pertaining to hypotheses for Problem 2 will be examined only if significant change occurs. The results for each of the following hypotheses are reported in the same order in Chapter IV as they are presented in Chapter I.

First Professional Quarter

The following hypotheses were investigated in terms of the project (S_1) group only.

Problem 1.

Hypothesis 1.

Preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for urban classroom science instruction at the completion of the first professional quarter experience.

Hypothesis 2.

Preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for suburban classroom science instruction at the completion of the first professional quarter experience.

Hypothesis 3.

Preservice teachers will not have changed significantly in their attitudes toward culturally deprived students at the completion of the first professional quarter experience.

Hypothesis 4.

Preservice teachers will not have changed significantly in their knowledge of culturally deprived students at the completion of the first professional quarter experience.

Problem 2.

Hypothesis 1.

There are no significant relationships between selected preservice teacher variables and the preservice teachers' views of the types of classroom activities they think should be used for science instruction in an urban setting.

Hypothesis 2.

There are no significant relationships between selected preservice teacher variables and the preservice teachers' views of the types of classroom activities they think should be used for science instruction in a suburban setting.

Hypothesis 3.

There are no significant relationships between selected preservice teacher variables and the preservice teachers' attitudes toward culturally deprived students.

Hypothesis 4.

There are no significant relationships between selected preservice teacher variables and the preservice teachers' knowledge of culturally deprived students.

Student Teaching Quarter

The following hypotheses were investigated in terms of the project (S_2) group and the non-project group.

Problem 1. Project

Hypothesis 1.

Project preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for urban classroom science instruction at the completion of the student teaching quarter.

Hypothesis 2.

Project preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for suburban classroom science instruction at the completion of the student teaching quarter.

Hypothesis 3.

Project preservice teachers will not have changed significantly in their attitudes toward culturally deprived students at the completion of the student teaching quarter.

Hypothesis 4.

Project preservice teachers will not have changed significantly in their knowledge of culturally deprived students at the completion of the student teaching quarter.

Problem 1. Non-project

Hypothesis 1.

Non-project preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for urban classroom science instruction at the completion of the student teaching quarter.

Hypothesis 2.

Non-project preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for suburban classroom science instruction at the completion of the student teaching quarter.

Hypothesis 3.

Non-project preservice teachers will not have changed significantly in their attitudes toward culturally deprived students at the completion of the student teaching quarter.

Hypothesis 4.

Non-project preservice teachers will not have changed significantly in their knowledge of culturally deprived students at the completion of the student teaching quarter.

Problem 2. Project and Non-project

Hypothesis 1.

There are no significant relationships between selected student teacher variables and the student teachers' views

of the types of activities which should be used for science instruction in an urban setting.

Hypothesis 2.

There are no significant relationships between selected cooperating teacher variables and the student teachers' views of the types of activities which should be used for science instruction in an urban setting.

Hypothesis 3.

There are no significant relationships between selected classroom student variables and the student teachers' views of the types of classroom activities which should be used for science instruction in an urban setting.

Hypothesis 4.

There are no significant relationships between selected student teacher variables and the student teachers' views of the types of activities which should be used for science instruction in a suburban setting.

Hypothesis 5.

There are no significant relationships between selected cooperating teacher variables and the student teachers' views of the types of activities which should be used for science instruction in a suburban setting.

Hypothesis 6.

There are no significant relationships between selected classroom student variables and the student teachers' views of the types of classroom activities which should be used for science instruction in a suburban setting.

Hypothesis 7.

There are no significant relationships between selected student teacher variables and the student teachers' attitudes toward culturally deprived students.

Hypothesis 8.

There are no significant relationships between selected cooperating teacher variables and the student teachers' attitudes toward culturally deprived students.

Hypothesis 9.

There are no significant relationships between selected classroom student variables and the student teachers' attitudes toward culturally deprived students.

Hypothesis 10.

There are no significant relationships between selected student teacher variables and the student teachers' knowledge of culturally deprived students.

Hypothesis 11.

There are no significant relationships between selected

cooperating teacher variables and the student teachers' knowledge of culturally deprived students.

Hypothesis 12.

There are no significant relationships between selected classroom student variables and the student teachers' knowledge of culturally deprived students.

Hypothesis 13.

There are no significant relationships between selected student teacher variables and the types of classroom activities which the student teachers used for science instruction during student teaching.

Hypothesis 14.

There are no significant relationships between selected cooperating teacher variables and the types of classroom activities which the student teachers used for science instruction during student teaching.

Hypothesis 15.

There are no significant relationships between selected classroom student variables and the types of classroom activities which the student teachers used for science instruction during student teaching.

Hypothesis 16.

There are no significant relationships between selected

student teacher variables and the student teachers' classroom student-teacher relationships.

Hypothesis 17.

There are no significant relationships between selected cooperating teacher variables and the student teachers' classroom student-teacher relationships.

Hypothesis 18.

There are no significant relationships between selected classroom student variables and the student teachers' classroom student-teacher relationships.

Hypothesis 19.

There are no significant relationships between selected student teacher variables and the student teachers' personal adjustment.

Hypothesis 20.

There are no significant relationships between selected cooperating teacher variables and the student teachers' personal adjustment.

Hypothesis 21.

There are no significant relationships between selected classroom student variables and the student teachers' personal adjustment.

First Professional Quarter And

Student Teaching Quarter

The following hypotheses were investigated for the project (S_1 and S_2) and for the non-project (student teaching quarter) groups.

Problem 1. Project vs. Non-project

Hypothesis 1.

Project and non-project preservice teachers will not hold significantly different views as to the types of science classroom activities which should be used for science instruction in urban classrooms at the completion of the student teaching quarter.

Hypothesis 2.

Project and non-project preservice teachers will not hold significantly different views as to the types of science classroom activities which should be used for science instruction in suburban classrooms at the completion of the student teaching quarter.

Hypothesis 3.

Project and non-project preservice teachers will not differ significantly in their attitudes toward culturally deprived students at the completion of the student teaching quarter.

Hypothesis 4.

Project and non-project preservice teachers will not differ significantly in their knowledge of culturally deprived students at the completion of the student teaching quarter.

Hypothesis 5.

Project and non-project preservice teachers will not differ significantly in terms of the types of science classroom activities which they use for their instruction during the student teaching quarter.

Hypothesis 6.

Project and non-project preservice teachers will not differ significantly in student-teacher relationships.

Hypothesis 7.

Project and non-project preservice teachers will not differ significantly in personal adjustment.

Definitions Of Terms

1. Urban and suburban. These terms were used two ways.
   a. In situations where the preservice teacher responded to instruments concerning the nature of science activities which should be used in urban (inner city) or in suburban (outer city) instruction, he was to define the terms from his own experience. No cues were provided in directions

given to the preservice teacher.

b. In situations where the terms were used as variables, the percentage of pupils in a particular school who were on Federal Aid to Dependent Children (FADC) was defined as follows:

Level	%FADC
1. Suburban	0-4
2. Intermediate	5-19
3. Urban	20+

2. Preservice teacher. Any science education student in the Professional Division of the College of Education enrolled in the first quarter of the senior year (S_1) or enrolled in student teaching.

3. First professional quarter. The quarter immediately preceding student teaching (S_1) for project preservice teachers.

4. Student teaching quarter. The quarter in which the preservice teacher was assigned to a school and had the primary responsibility for the teaching of two or more classes. During this quarter the preservice teacher was supervised by a cooperating teacher and a university supervisor.

5. Project. A science preservice teacher education program developed by the Faculty of Science and Mathematics Education consisting of a five quarter sequence. There are three consecutive quarters in the preservice teachers' junior year and two quarters in the pre-

service teachers' senior year. In this study the term project refers to the two quarters of the senior year, designated as S_1 and S_2 respectively. Appendix F of this report provides information concerning the 1970-71 two quarter Senior Project sequence. Sagness (1970) described the 1969-70 Senior Project.

6. Non-project. A science preservice teacher education program used by the Faculty of Science and Mathematics Education at The Ohio State University as the conventional program in 1970-71. As of Summer Quarter 1971 this program is not available for students entering the Professional Division of the College of Education. This program has been displaced by a five quarter sequence of which S_1 and S_2 are part. A description of the non-project program may be found in the Sagness (1970) report.
7. Cooperating teacher. The public school teacher who supervised the preservice teacher during the student teaching assignment.
8. University supervisor. The faculty member or teaching associate assigned by the Faculty of Science and Mathematics Education who supervised the preservice teacher during the student teaching assignment.
9. Culturally deprived. An individual who lacked many of the opportunities normally available to American children (Skeel, 1966). Synonymous terms are

culturally disadvantaged, socially or economically deprived or different.

10. Pretest. Instruments administered prior to experiences in a particular quarter.

11. Posttest. Instruments administered after experiences in a particular quarter.

12. Pilot. The Checklist for Assessment of Science Teachers: Pupil's Perceptions (CAST:PP) was used Winter Quarter 1971 and Spring Quarter 1971 with fifteen cooperating teachers and fifteen student teachers. The instrument had two subscales: (1) student-teacher relations and (2) use of classroom activities.

Variables Measured

Sagness (1970) measured forty-eight variables for the first professional quarter and one hundred twenty variables for the second or student teaching quarter. A review of the Sagness study resulted in the elimination of several variables and the addition of variables measured by the Checklist for Assessment of Science Teachers: Supervisor's Perceptions (CAST:SP) and a revised student questionnaire. A Pupil's Perceptions form of the CAST was used as a pilot instrument (CAST:PP). The following instruments were used to obtain information.

Data Collection Instruments

From preservice teachers:

1. Science Classroom Activity Checklist: Teacher's Perceptions (SCACL:TP)
2. Cultural Attitude Inventory (CAI)
3. Student Teacher Questionnaire (STQ)
4. Personnel records of the College of Education (PR)

From cooperating teachers:

5. Cooperating Teacher Questionnaire (CTQ)
6. Checklist for Assessment of Science Teachers: Supervisor's Perceptions (CAST:SP)

From classroom students:

7. Science Classroom Activity Checklist: Student's Perceptions (SCACL:SP)
8. Student Questionnaire (SQ)
9. Checklist for Assessment of Science Teachers: Pupil's Perceptions (CAST:PP)

From university supervisors:

10. Checklist for Assessment of Science Teachers: Supervisor's Perceptions (CAST:SP)

A brief description of the variables by quarter and category and the instrument used to measure each follow. Criterion variables are marked with an asterisk.

First Professional Quarter Preservice Teacher Variables

*1.	Views of the types of classroom activities which should be used for	SCACL:TP

	science instruction in an urban or suburban setting.	
2.	Views of student classroom participation which should occur in science instruction in an urban or suburban setting.	SCACL:TP
3.	Views of the role of the teacher in the classroom which should occur in science instruction in an urban or suburban setting.	SCACL:TP
4.	Views of the use of textbooks and reference materials which should occur in science instruction in an urban or suburban setting.	SCACL:TP
5.	Views of the design and use of tests which should occur in science instruction in an urban setting.	SCACL:TP
*6.	Attitudes toward culturally deprived students.	CAI
*7.	Knowledge of culturally deprived students.	CAI
8.	American College Test composite percentile score.	PR
9.	Grade point average total at beginning of student teaching.	PR

Student Teaching Quarter Variables

Classroom students:

1.	Attitude toward science course	SQ
2.	Direction of student teacher influence	SQ
3.	Direction of regular teacher influence	SQ
4.	Attitude toward textbook, if used	SQ
5.	Attitude toward laboratory manual, if used	SQ

Student teachers:

1.	Attitude toward class	STQ
2.	Attitude toward cooperating teacher	STQ
3.	Minutes of laboratory work per week	STQ
*4.	Student-teacher relations	CAST:SP
*5.	Use of classroom activities	CAST:SP
*6.	Teacher's personal adjustment	CAST:SP
*7.	Type of science activities used for classroom instruction	SCACL:SP
*8.	Views of the types of classroom activities which should be used for science instruction in an urban or suburban setting	SCACL:TP
*9.	Attitudes toward culturally deprived students	CAI
*10.	Knowledge of culturally deprived students	CAI

Cooperating teachers:

1.	Sex	CTQ
2.	Age	CTQ
3.	Total number of students taught per day	CTQ
4.	Number of classes (Primary content area)	CTQ
5.	Attitude toward class	CTQ
6.	Attitude toward teaching science	CTQ
7.	Attitude toward textbook used by students	CTQ
8.	Use of curriculum project materials	STQ
9.	Attitude toward laboratory facilities	CTQ
10.	Types of science activities used for classroom instruction	SCACL:SP

Pilot Measures

Student teachers:

1.	Student-teacher relations	CAST:PP
2.	Use of classroom activities	CAST:PP

Cooperating teachers:

1.	Student-teacher relations	CAST:PP
2.	Use of classroom activities	CAST:PP

Descriptive Variables

1.	Preservice teacher mean age	PR
2.	Preservice teacher mean sex	PR
3.	Preservice teacher mean grade point average	PR

4.	Cooperating teacher mean age	CTQ
5.	Cooperating teacher mean sex	CTQ
6.	Cooperating teacher mean total years of experience	CTQ
7.	Cooperating teacher mean total number students per day	CTQ
8.	Cooperating teacher mean number classes/day primary assignment	CTQ
9.	Mean class size by FADC levels	STQ
10.	Frequency of schools by FADC levels	
11.	Frequency of classes by grade level	STQ
12.	Frequency of classes by science area	STQ
13.	Frequency of classes by use of curriculum project materials	STQ

Assumptions

The following assumptions were made.

1. The Science Classroom Activity Checklist: Teacher's Perceptions (SCACL:TP) was a valid and reliable instrument for determining the nature of science classroom activities which preservice teachers thought should be used for secondary school instruction.
2. The Science Classroom Activity Checklist: Student's Perceptions (SCACL:SP) was a valid and reliable instrument for determining the nature of the science classroom activities which preservice and inservice

teachers used for their instruction.

3. The types of science classroom activities which should be used to positively implement the contemporary objectives of science education applied regardless of the environmental setting (urban-suburban).
4. The views held by a preservice teacher toward the types of classroom activities which should be used for science instruction in a particular environmental context did in fact influence the preservice teacher's behavior when he was teaching.
5. The Cultural Attitude Inventory (CAI) by Skeel (McREL version) was a valid and reliable instrument for determining preservice teachers' attitudes toward and knowledge of culturally deprived students.
6. The classroom student, student teacher, and cooperating teacher questionnaires were valid and reliable instruments for collecting descriptive and attitudinal information from students, student teachers, and cooperating teachers respectively.
7. The Checklist for Assessment of Science Teachers: Supervisor's Perceptions (CAST:SP) was a valid and reliable instrument for determining the student teachers' student-teacher relations, types of classroom activities used, and personal adjustment as assessed by cooperating teachers and university supervisors.
8. The Checklist for Assessment of Science Teachers:

Pupil's Perceptions (CAST:PP) was a valid and reliable instrument for determining the student teachers' student-teacher relations and types of classroom activities used.

9. The classroom students, preservice teachers, cooperating teachers, and university supervisors responded to instruments in a manner which reflected their own personal perceptions rather than those which they perceived as being desirable from the viewpoint of extraneous influences.

Delimitations

Delimiting factors in this study were the following.

1. The population of the study was delimited to preservice teachers in the Professional Division of the College of Education at The Ohio State University.
2. The population was delimited to all preservice teachers enrolled in either the Senior Project or non-project student teaching offered by the science education component of the Faculty of Science and Mathematics Education during the 1970-71 academic year.
3. A study of teacher effectiveness, in terms of attempting to correlate student achievement with preservice or inservice teacher behavior, was beyond the scope of this study.
4. This study was not concerned with value judgements

relative to any one individual concerning behaviors or attitudes as reflected in responses to the instruments. The only concern was group outcomes which were used in systematic analysis of the teacher education programs in science education at The Ohio State University.

5. Two different versions of the Student Questionnaire were used due to difficulties in hand scoring large numbers of questionnaires.
6. The Checklist for Assessment of Science Teachers: Pupil's Perceptions was used with fifteen selected cooperating teachers and their student teachers on a pilot basis.

Limitations

Limiting factors in this study were the following.

1. Preservice teachers were not randomly assigned to either the project or non-project science teacher education programs.
2. Student teachers were not randomly assigned to schools and cooperating teachers.
3. Instruments were not administered at the same exact points in time during any one quarter.
4. Factors such as motivation, personal problems, and others may have affected the responses to various instruments, but control of these factors was not part

of this study.

5. Project preservice teachers were aware that they were participants in an experimental program.
6. Certain classroom students, preservice teachers, cooperating teachers, and university supervisors did not complete all data collection instruments. As a result the total number of responses to any specific item varied.

Design and Method

Populations and Samples

The preservice teacher population of ninety-two was comprised of students in secondary (7-12) science education at The Ohio State University. Both project and non-project preservice teachers were involved during Autumn Quarter 1970, Winter Quarter 1971, and Spring Quarter 1971. Project students were enrolled in their first professional quarter (S_1) preceding student teaching or in their student teaching quarter (S_2). Non-project preservice teachers were enrolled in student teaching.

The public schools used in the study were located in the Columbus, Ohio metropolitan area. Twenty-four of the forty-five schools were Columbus City Schools. They were categorized into urban, suburban, and intermediate categories based on Federal Aid to Dependent Children levels. The intact classroom was the unit for classroom student

data collection. Both project and non-project student teachers had responsibility for a minimum of two classes in a single school.

Instrumentation

Science Classroom Activity Checklist

Two forms of the checklist were used. The Teacher's Perceptions form was used with preservice teachers to assess the nature of the science classroom activities they thought should be used for classroom instruction. Preservice teachers responded to this instrument in both urban and suburban contexts.

The Student's Perceptions form of the instrument was administered to classroom students. At the beginning of the quarter the instrument was given to students who responded in terms of their cooperating teacher. Classroom students answered the instrument in terms of their student teacher at the end of the quarter.

Cultural Attitude Inventory

A version of this instrument, revised by McREL Laboratories based on work by Dorothy Skeel, was used in this study. The two subscales used in this study were concerned with the respondent's attitude toward and knowledge of culturally deprived children.

Questionnaires

Three questionnaires were used to gather descriptive and attitudinal information from classroom students, student teachers, and cooperating teachers.

Personnel records

American College Test composite percentile scores, grade point averages as of the beginning of the student teaching quarter, and the student teachers age in years were obtained from the personnel records of the College of Education.

Checklist for Assessment of Science Teachers

Two forms of this instrument were developed to assess characteristics of science teachers. The three areas assessed were: (1) student-teacher relations, (2) classroom activities used by the teacher, and (3) teacher's personal adjustment. The pupil's perceptions form assessed the first two areas; the supervisor's form assessed all three areas.

The supervisor's form was used with cooperating teachers and university supervisors all three quarters of the study. The pupil's perceptions form was used Winter and Spring Quarters on a pilot basis with fifteen cooperating teachers and their student teachers.

Data Collection Procedures

First professional quarter

The data were collected from the preservice teachers in

a group situation during the first week of the quarter for the pretests and during the last week of the quarter for the posttests. The Science Classroom Activity Checklist: Teacher's Perceptions for both urban and suburban contexts and the Cultural Attitude Inventory were administered.

Student teaching quarter

Data from project student teachers

Test scores from the first professional quarter posttest were used as the student teaching quarter pretests. Posttest data were collected following the procedure for the first professional quarter. A questionnaire was completed by the student teachers. The investigator gathered descriptive data from the College of Education office near the end of this quarter.

Data from non-project student teachers

Pretest data were collected following the procedure outlined for the first professional quarter for project preservice teachers. The non-project posttest data collection paralleled that of the project student teachers.

Data from cooperating teachers

The cooperating teachers completed a questionnaire and the Checklist for Assessment of Science Teachers: Supervisor's Perceptions (CAST:SP) at the end of the quarter in which they worked with student teachers.

Data from classroom students

The Science Classroom Activity Checklist: Student's Perceptions (SCACL:SP) was completed twice by each student in two of the classes with which the student teacher worked. The first collection of classroom student checklist data was performed during the first two weeks of the student teaching quarter. The classroom students state their perceptions of the science classroom activities which their regular (co-operating) teacher used. The procedures for the second data collection were essentially the same as those for the first collection. The differences were: (1) classroom students gave their perceptions of the science activities which the student teacher used in his instruction, (2) the student teacher administered the instruments rather than the co-operating teacher, and (3) the pupils completed a questionnaire.

The procedure followed for Winter Quarter and Spring Quarter pilot testing of the Checklist for Assessment of Science Teachers: Pupil's Perceptions was the same as for the SCACL:SP except that classroom students did not complete a questionnaire.

Data from university supervisors

Graduate students and professors in science education at The Ohio State University completed the CAST:SP in terms of the student teachers they supervised.

Statistical Analysis

Hypotheses involving the analysis of pretest-posttest within group differences were tested using the t-test for testing differences in means. Hypotheses involving the analysis of posttest differences between the project and non-project groups were tested using a Multivariate Analysis of Variance program.

Chi square was computed for the university supervisors' ratings of student teachers' subscale A scores on the CAST:SP.

If within group or between group differences existed, correlations were obtained using a computerized BMD-03D Correlation with Item Deletion program. Program BMD-02R Stepwise Regression program was used with cases for which complete data were available. A second series of regressions were computed with the variables that accounted for the greatest amount of the variance removed.

Overview

This report includes five chapters.

Chapter I: Introduction and general overview of the study.

Chapter II: Review of the literature including an abstract of the 1969-70 Sagness study.

Chapter III: The study -- design and method. This is discussed in four sections:

1. Population and Samples

2. Instrumentation
3. Data Collection Procedures
4. Statistical Analysis

Chapter IV: Analysis. The findings are discussed in the order of the hypotheses presented in Chapter I.

Chapter V: Summary, conclusions, and recommendations. The study is summarized and conclusions and recommendations are presented.

CHAPTER II

REVIEW OF THE LITERATURE

This chapter contains two sections. The first section is an abstract of the 1969-70 study by Richard Sagness (1970). The second section is a review of the current research on the effects of teacher education programs on preservice teachers. The reader is referred to the Sagness (1970) report for a review of earlier research.

Abstract of the 1969-70 Sagness Report

A Study of Selected Outcomes of a Science Preservice Teacher Education Project Emphasizing Early Involvement in Schools of Contrasting Environmental Settings by Richard L. Sagness assessed selected outcomes of two preservice teacher education programs in secondary school science education at The Ohio State University. One program (project) emphasized classroom participation in schools of two environmental settings (urban and suburban) previous to student teaching. Student teaching also occurred in two schools of contrasting environmental settings. The other program (non-project) was developed around methods courses and other university-based courses with few participatory experiences in the public

schools previous to student teaching. Student teaching was done in one school. The sample was comprised of preservice teachers in secondary (7 - 12) science education. They were enrolled in the first professional quarter (N = 64) immediately preceding student teaching, or in the student teaching quarter (N = 34).

The selected outcomes (criterion variables) were the preservice teachers' views of activities which should be used for science instruction in an "urban" setting, those which should be used for a "suburban" setting, the activities the preservice teachers used for instruction during student teaching, and preservice teachers' compatibility to work in culturally deprived schools. The compatibility variable was subdivided into two factors (1) attitudes toward culturally deprived students, and (2) knowledge of culturally deprived students. The relationship of selected preservice teacher variables and, where applicable, cooperating teacher, classroom student, and administrative variables to selected outcomes were also measured.

The instruments used were the Science Classroom Activities Checklist: Teacher Perceptions, the Science Classroom Activities Checklist: Student Perceptions, and the Cultural Attitude Inventory. Measures on these variables, with the exception of activities used during student teaching, were taken prior to and at the completion of the preservice teachers' first professional quarter and also pre- and post-

student teaching. The activities which student teachers used for instruction were measured, by means of classroom student checklist responses, near the end of the student teaching experience. Other student teaching data were collected using questionnaires.

Some conclusions were (1) project participants had significantly greater knowledge of culturally deprived students at the end of the first professional quarter than did non-project participants, (2) project student teachers held less positive views of culturally deprived students and of the types of activities which should be used for science instruction in an urban setting at the completion of the student teaching experience than did non-project participants, (3) project student teachers used significantly fewer of the types of activities thought to positively implement the general objectives of science education than did non-project student teachers, and (4) the major influence on the activities used by student teachers for science instruction during student teaching was the cooperating teacher. Relationships are also indicated which provide insight into criteria that might be employed in the selection of schools and cooperating teachers for student teacher placement.

Preservice Teacher Education

Seven preservice teacher education programs are reviewed in this section. Elements of these programs that

are pertinent to this study are that these programs (1) are current, (2) involve early experiences of the preservice teacher in the public schools, or (3) involve experiences in urban education.

An Evaluation of a Secondary Mathematics Teacher Education Program Emphasizing School Experiences in Contrasting Cultural Settings closely paralleled the study by Sagness (Graening, 1971).

Hypotheses concerning patterns of change and correlational relationships were tested for both project and non-project teachers. These focused on the following criterion variables: (1) perceptions of what should occur in secondary mathematics teaching as measured by the Mathematics Teaching Inventory: Teacher Perceptions (MTI:TP), (2) compatibility to teach in culturally disadvantaged schools and attitudes toward and knowledge of culturally disadvantaged students as measured by Skeel's Cultural Attitude Inventory, and (3) reactions to classroom teaching situations as measured by the Teaching Situation Reaction Test. The strategies and activities used by the cooperating and student teachers in their secondary mathematics teaching were measured by the Mathematics Teaching Inventory: Student Perceptions (MTI:SP). The MTI:TP and the MTI:SP were parallel instruments developed for the study. Additional data from questionnaires and daily logs were informally analyzed.

Project preservice teachers held significantly more

positive views of what should occur in the mathematics classroom at the end of the pre-student teaching block (S_1) than at the beginning. The changes in reactions to teaching situations and cultural compatibility were also more positive but not significant. Questionnaire responses and log reactions indicated that project teachers were enthusiastic about the program, particularly their in-school experiences.

No significant differences (.05 level) were found between project and non-project student teachers on the criterion measures. A substantially higher percentage of project than non-project student teachers indicated an increased commitment to teaching and a posttest preference for junior high school teaching.

There was a significant positive correlation between the activities and strategies used by the student teachers during student teaching and those of their cooperating teachers. The student and cooperating teachers' perceptions of what should occur in secondary mathematics teaching also correlated significantly in the positive direction.

The most dramatic result of the study was that during the student teaching quarter the preservice teachers (both project and non-project) exhibited significant losses on each of the criterion variables. Cultural attitudes and reactions to teaching situations had the greatest negative change.

The Tutorial and Clinical Program (T&C) at Northwestern

University in Evanston, Illinois is a current program that emphasizes the early involvement of preservice teachers with students in the elementary and secondary schools. This program is reported by Hazard (1967), Hazard, Chandler, and Stiles (1967), and Howarth and Stiles (1969).

The name of the program reflects the function of the professional staff involved in preservice teacher education. A tutorial professor, who is a member of the school of education at Northwestern, works with ten to twelve college students with the university as the primary setting. A clinical professor, who is a master teacher in the public schools, works with the preservice teachers in a public school environment. The functions of this program are: (1) to increase the relevancy of professional education, (2) to make teacher preparation a function of numerous departments of the university, and (3) to strengthen the academic preparation of preservice teachers.

College students begin the T&C program in the first quarter of their freshman year. Preservice teacher experiences during the freshman year are university based group and individual activities with a tutorial professor.

The preservice teachers work with a cooperating teacher in the public schools during their sophomore year. The cooperating teacher is under the direction of a clinical professor.

Specialization in the subject field of the preservice

teacher occurs in the junior and senior years. The specialization is in both campus based academic work and in the types of public school experiences. Prospective secondary teachers specialize in their major teaching fields with older students while prospective elementary teachers specialize in working with younger students. The preservice teacher participates in field assignments during his senior year. During these experiences he may use the competencies he has developed during the first three years of the T&C program.

The evaluation of the T&C program is designed to explore three questions: (1) does the T&C program attract "better" students than other programs at Northwestern, (2) does the T&C program retain a higher per cent of the students in the program than the optional (conventional teacher preparation) program, and (3) does the T&C program produce graduates who enter teaching, who stay in teaching, and who are competent teachers?

The most current report on the T&C program (Howarth and Stiles, 1969) presents preliminary data addressed to the preceding three questions. Trend information based on the College Entrance Examination Board test and the rank in high school of incoming freshmen indicates that the T&C program does attract students who are comparable with non-education students and with preservice teachers in the optional program. A comparison of the retention frequencies of the

T&C and the optional programs for the first class to complete the four year sequence indicates that the T&C program did retain a higher percentage of students than the conventional program.

The third question has not been evaluated. The evaluation scheme is to follow the T&C and optional program graduates for three years after graduation. In addition to frequency data, self perception by the inservice teachers and assessment by supervisors will be directed toward evaluating which group had the most realistic expectations of their first teaching experiences and what were the major areas of difficulty.

A sixteen week, problem centered, clinical approach to preservice teacher education has been implemented at the University of Illinois (Travers, 1971).

The public school experience component of the teacher preparation program is divided into two major types of experiences. The first type of experience is a three-week program involving the teaching of mini-lessons and related activities in the mornings. The afternoons are occupied with observations, seminars, and other in-school based activities.

Thirteen weeks of heavy involvement, the second type of major experience, includes the "shadowing" of a high school student for a day and other student teaching responsibilities (Graening, 1971).

No formal evaluation of this program has occurred. The general goals of the preservice program are: (1) to design and implement a cooperative program between the public schools and the university, (2) to link preservice teacher education to the activities of inservice teachers, (3) to operationalize a team approach to professional education involving both public school and university personnel, (4) to provide a broad spectrum of experiences for the preservice teacher, and (5) to individualize teacher education to the interests and needs of each preservice teacher.

The Cooperative Urban Teacher Education Program (CUTE) is designed to educate underprivileged children and to prepare teachers for inner city assignments (Clothier, 1968). Universities in Kansas and in Missouri, the public schools of Kansas City, Missouri, and the Mid-continent Regional Education Laboratory (McREL) are collaborating in this program.

A team consisting of a psychiatrist, a sociologist, and two teacher educators works with the preservice teachers. The team attempts to have the preservice teacher understand himself and his students as they are influenced by experiences, by socio-economic background, and by personal needs. Self-directed learning by the preservice teacher is emphasized.

The evaluation of the CUTE program involved the use of the Cultural Attitude Inventory (CAI) by Skeel (Weber and

Lawson, 1968). The McREL version of the Skeel CAI was used by this investigator to assess the preservice teachers' knowledge of and attitudes toward culturally deprived students. During the student teaching quarter the CUTE students had significantly increased composite scores on the CAI. A high composite score on the CAI was interpreted as being indicative of preservice teachers' compatibility for working with culturally deprived students. The CUTE preservice teachers had CAI composite scores higher than control groups.

An experimental program of professional education for secondary teachers at Kansas State Teachers College is a three phase operation that integrates professional teacher preparation with companion laboratory experiences (Sandefur, 1967). Operational principles of the program are: (1) no formal lectures, (2) no tests, and (3) no sarcasm or ridicule is used in order to maintain threat-free classrooms.

Phase one of the three phases is observation. During the first semester of his junior year, the preservice teacher observes both live and via closed-circuit television in the campus laboratory school. The observations are accompanied by appropriate readings and seminars.

Participation for one hour a day in a high school situation is phase two. During this phase the preservice teacher acts as a teacher and as a teacher aid under the direction of a public school inservice teacher. This phase

occurs during the second semester of the preservice teacher's junior year.

Phase three is a one-half semester, full time, experience as a student teacher in a public school during the preservice teacher's senior year.

A conventional preservice teacher education program (N=53), consisting of seven campus-based courses, was run concurrently with the experimental problem or thematic approach sequence (N=62). The preservice teachers were randomly assigned to the control and to the experimental groups.

Instruments used to gather evaluative data were The Classroom Observation Record, a system of interaction analysis, and the National Teacher Examination (NTE). The grades achieved during student teaching were also used as criterion measures. Pretest and posttest scores on the NTE and results from three visits by supervisors to each preservice teacher during his experience in the public schools were used to evaluate the program.

Results and conclusions are as follows: (1) The experimental group had a more desirable behavior rating as assessed by The Classroom Observation Record. There was a significant difference between the experimental and control groups. (2) The experimental group used more activity than the control group as measured by a sixteen category interaction analysis system. (3) The grades for student teaching were higher for the experimental group than for the

control group. (4) The control group scored higher on the Professional Education section of the NTE. Although the control group possessed more facts than the experimental group, as assessed by scores on the NTE, the teaching behavior of the control group was more traditional and less desirable as assessed by qualified, independent observers. (5) The behavior of preservice teachers can be changed by direct involvement in the teaching act. The preservice teacher can be sensitized to the use of certain desirable teaching actions such as the use of praise and acceptance of students' ideas.

Two types of programs at the University of Wisconsin at Milwaukee involve the preservice teacher in reality based situations (Denemark, 1967).

A pre-student te[illegible]rogram gives preservice teachers opportunities [illegible]h experienced inservice teachers. The college students function as tutors to students who have been identified as requiring aid. This field experience is taken concurre[illegible]ly with educational psychology and human development courses.

The Wisconsin Remedial Teacher Project involves college sophomores and juniors as observer-helpers for two to three hours a week for six weeks.

Evaluation of the project, as reported by Denemark (1967), involved a population of twenty-two females. Instruments used were logs compiled by the preservice teachers,

pretest and posttest scores on the Minnesota Teacher Attitude Inventory and Bill's Index of Adjustment and Values (Bill's). Although no control groups were cited, the project group of females showed positive reactions to their experiences with the remedial teacher project and to their relationships with children. The preservice elementary teachers had positive actual self and acceptance of self ratings but did not change significantly on the ideal self subscales of the Bill's instrument.

The Off-Campus Methods Course is a program that was pilot tested in 1968 in Toledo, Ohio (Walsh, 1970). Early involvement in inner city settings was completed by college juniors in a social studies techniques course as part of an elementary preservice teacher program.

The four phases of the program were: (1) a theoretical introduction to elementary social studies instruction in inner city settings, (2) observations of inner city inservice teachers, (3) teaching experiences by the preservice teacher, and (4) analysis of the teaching that occurred in phases two and three by inservice and preservice teachers respectively. Teaching episodes that focused on a particular teaching strategy were emphasized throughout the four phases.

Evaluation of the pilot program was by poll of the participants. Although details of the evaluation were not reported, the preservice teachers, inservice teachers, and

public school students gave generally favorable responses to the questions asked on the poll. No formal evaluation or use of control groups was reported.

In addition to the seven programs cited previously, other institutions and investigators have been concerned with the outcomes of components of current preservice teacher education programs.

A study by Uhlhorn at Indiana State University attempted to identify the significant factors which influence the success of pre-student teaching elementary education majors' science lessons (Uhlhorn, 1968). The conclusions were based on multiple correlations and regression studies of: (1) the individual elements of a lesson rating scale, (2) the grades from various activities in a methods course, and (3) the classroom teacher's over-all rating.

Factors which are significant predictors of the over-all success of a lesson and of the final course grade were: (1) the establishment of a favorable learning climate, the degree of organization in the presentation, (3) the involvement of the class in discussion, (4) the establishment of clear science concepts, and (5) the development of a lesson summary.

Breit (1969) examined the relative effectiveness of a teacher education program given in preservice and in inservice contexts. Knowledge, perception of goals and methods of curriculum innovation, and facility in coping with

learning situations that emphasized self-direction by the classroom students were the three teacher competencies Breit used as criteria in his study. Both the preservice group (N = 58 undergraduate students in a science methods course) and the inservice group (N = 28 elementary science teachers) showed significant pretest to posttest gains on the criterion measures.

A review of the Breit study by Welch (1971) indicates that causal factors were not identified. Those factors that may have accounted for the significant changes in both groups were not identified.

The methods of teaching course is taken concurrently with elementary or secondary level student teaching at the University of Massachusetts. Freimarch (1971) studied the effects of methods courses and student teaching on the philosophical and educational beliefs of student teachers. The Massachusetts Philosophical and Educational Belief Inventory and the Massachusetts Philosophical Inventory, which assessed traditional and liberal ideas in general, were administered as pretests and as posttests. Also administered were an educational policies and viewpoints test and the California Personality Inventory. Analysis of covariance was performed on the posttests using the pretests as the covariates. The methods course and the student teaching experiences did not show significant effects on philosophical and educational beliefs.

Walberg (1968) investigated role conflict and self-conception in urban practice teachers. His results supported his hypothesis that a conflict between one's personality and his role lowers self-conception in student teachers. Preservice teachers need to associate and identify with the students they teach.

Walberg's population consisted of seventy-seven female preservice teachers. Two-thirds of these teachers were at the elementary level and one-third student taught in secondary schools. Walberg used a pre and post questionnaire, twenty-six, six point semantic differential scales and eighteen similarly constructed bipolar phrase scales. Student teachers rated themselves as teachers, and they also rated themselves as their pupils would using a series of favorable-unfavorable adjectives. The experimental design was a one-group, pre-posttest design.

Student teachers who had a conflict between their self-conception and their role as a teacher in an urban setting generally had: (1) less adequate understandings of children, (2) lower expectations of pupil behavior, (3) lower aspirations for self in the role of the teacher, and (4) less rapport with their classes.

Perkes (1968) at the University of California at Davis explored junior high school science teacher preparation, teaching behavior, and student achievement. This correlational study involved thirty-two junior high inservice

general science teachers and 3062 classroom students.

Higher grade point averages in science, more recent enrollment in college science courses, and greater number of units in science education proved to be directly related to: (1) more frequent teacher-student discussions, (2) more frequent use of equipment, (3) more frequent student participation in laboratory activities, (4) greater use of questions of a hypothetical nature, and (5) more lessons stressing principles of science. Teachers who had lower grade point averages in science, less current enrollment in college science courses, and fewer units of science education: (1) used the techniques of lecturing, summarizing, and explaining more frequently, (2) conducted more demonstrations for their classes, and (3) asked more questions requiring recall of factual information.

A Survey of Interpersonal Values (SIV), the Minnesota Teachers Attitude Inventory and the California Psychological Inventory (CPI) were used by McFadden (1968) in a study of the discrimination of student teaching performance on the basis of psychological attributes. A group of forty elementary and a group of forty-nine secondary student teachers were each divided into three groups ranked as high, middle, and low on the basis of supervisors' ratings in student teaching.

Multiple discriminant analysis was used. The SIV conformity and independence subscales and the CPI tolerance

and communality subscales made significant contributions to distance between the three elementary groups. Significant distance between the three secondary groups was accounted for by the SIV recognition subscale and the CPI capacity for status, communality, achievement via conformity, and psychological mindedness subscales. McFadden concluded that groups of student teachers could be discriminated between on the basis of certain value and psychological characteristics.

Chabassol (1968) investigated the possession of certain attitudes as predictors of success in practice teaching with forty-two male and 131 female second year elementary preservice teacher education students at the University of Victoria, Canada.

A measure of rigidity in thinking, an assessment of parental attitudes toward children, and an [illegible] on o[illegible] hostility scale were used. The best predictors of success in practice teaching were the hostility scale for males and the rigidity in thinking scale for females. Chabassol concluded that sex must be taken into account when predicting success in practice teaching situations.

Summary

The studies cited in this review deal with research related to programs and research related to methodology.

Research Related to Programs

Few current programs involve early experiences of preservice science teachers in the public schools. Little research has been completed on outcomes of these programs. Common elements of the preservice teacher education studies reviewed are that they were non-longitudinal and the evaluations involved a single experimental group in one cycle of a program. No studies were found in which the first evaluation was followed by a second evaluation of another group of participants in the same program.

Research Related to Methodology

Variables or methods which were used to evaluate programs or components of programs are: (1) grades, (2) ratings by supervisors, (3) interaction analysis schemes, (4) standardized tests, (5) frequencies, and (6) attitude scales. The most frequent research design compared an experimental or pilot program to a conventional program. The comparisons involved a single group of participants in one cycle of a program. The pretest-posttest method was used frequently.

Longitudinal evaluations of preservice programs may be categorized as those evaluations which follow participants in the preservice programs into their inservice experiences and those evaluations which follow a program in successive years. The reader is referred to literature reviews by Brewington (1971) and Cignetti (1971) concerning beginning

inservice teachers who have had various preservice experiences. No studies were found which dealt with longitudinal evaluations of programs in successive years.

CHAPTER III

THE STUDY -- DESIGN AND METHOD

This chapter is divided into four sections: (1) a brief description of the population or samples of populations, (2) a description of the instruments used and their development, (3) a description of the data collection procedures, and (4) a description of the statistical procedures used in the analysis.

Population and Samples

The preservice teacher population was comprised of students in secondary (7-12) science education at The Ohio State University. They were enrolled in their first professional quarter preceding student teaching (S_1) or in their student teaching quarter. Both project and non-project preservice teachers were involved during Autumn Quarter 1970, Winter Quarter 1971, and Spring Quarter 1971. The frequency of preservice teachers by quarter and program classification is shown in Table 1, p. 57.

The preservice teachers were not randomly selected for the study but involved all S_1 and student teachers in science education at The Ohio State University. Preservice

TABLE 1

FREQUENCY OF PRESERVICE TEACHERS BY QUARTER AND PROGRAM CLASSIFICATION[a]

	Quarter							
	Aut.		Win.		Sp.		Totals	
	P	N	P	N	P	N	P	N
First Professional Quarter	22	x	26	x	0	x	48[b]	x
Student Teaching Quarter	0	15	21	10	25	21	46	46

[a]P= Project
N= Non-project

[b]Of the 48 S_1 students, three did not student teach. One S_1 from 1969-70 student taught Winter Quarter.

teachers were not randomly assigned to either project or non-project sequences. The primary determinants as to choice of project or non-project sequences were the teachers' desires and their remaining graduation requirements. Descriptive information of the age, sex, and grade point average of preservice teachers is shown in Table 2, p. 58.

Student teachers were not randomly assigned to schools or to cooperating teachers. Non-project student teachers were assigned in terms of subject area and grade level to be taught with the permission of the school system, the in-

TABLE 2

MEANS, STANDARD DEVIATIONS, AND NUMBERS FOR PRESERVICE TEACHER DESCRIPTIVE VARIABLES[a]

	Project			Non-Project		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Age(years)	21.62	3.27	45	23.22	3.09	45
Sex(0=male) (1=female)	0.44	0.84	45	0.31	0.47	45
Grade Point Average(4=A to F=0)	2.98	0.76	45	2.92	0.45	45

[a]Data as of the beginning of the S_2 quarter.

dividual school, and the specific cooperating teacher.

Project student teachers (S_2) were assigned to schools and cooperating teachers involved in the science education project. These schools had both S_1 and S_2 students participating during the same quarter. The project student teachers, in many instances, taught with the cooperating teachers with whom they had worked during their S_1 quarter.

Descriptive information of project and non-project cooperating teachers is shown in Table 3, p. 59. A total of ninety cooperating teachers were involved. Two project cooperating teachers had two student teachers during the year, but not during the same quarter.

TABLE 3

MEANS, STANDARD DEVIATIONS, AND NUMBERS FOR COOPERATING TEACHER DESCRIPTIVE VARIABLES

	Project			Non-Project		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Age(years)	38.53	9.65	45	36.74	11.34	39
Sex(0=male) (1=female)	0.13	0.34	46	0.27	0.45	41
Total Years of Experience	12.09	8.60	46	10.87	7.92	39
Number of Students Per Day	132.22	34.17	45	132.57	22.33	37
Number of Classes Per Day in Primary Assignment	4.29	1.29	44	4.18	1.23	39

The schools were located in the Columbus, Ohio metropolitan area. There were twenty-four Columbus City Schools and twenty-one schools in other area systems. They were categorized into urban, suburban, and intermediate categories. No rural schools were incorporated into either the project or non-project student teaching experiences. The frequency of project and non-project schools and classes in urban, intermediate, or suburban categories is shown in a table (Table 4, p. 60).

TABLE 4

FREQUENCY OF SCHOOLS AND CLASSES BY PROGRAM CLASSIFICATION AND URBAN-SUBURBAN CATEGORY

		Program Classification					
		Project		Non-Project		Totals[a]	
		Schools	Classes	Schools	Classes	Schools	Classes
Urban	1	17	62	15	64	30	126
Suburban	2	6	20	8	18	9	38
Category	3	5	10	2	10	6	20
Totals		28	92	25	92	45	184

[a]Since both project and non-project student teachers were assigned to the same building, the total number of schools is less than the sum of the individual schools.

Classes were distributed among grade levels seven through twelve. Science areas represented were biology, chemistry, physics, physical science, earth science, and general science. Seven classes were classified in the category of "other." This classification included life science and advanced science courses which were not restricted to a specific subject area. Eighty-four of 184 classes used curriculum project materials such as Biological Sciences Curriculum Study (BSCS), Chemical Education Materials Study (CHEMS), Physical Science Study Committee (PSSC), Introductory Physical Science (IPS), Earth Science Curriculum

Project (ESCP), or Interaction of Matter and Energy (IME). These curriculum projects listed are illustrative but may not include all curriculum project materials used in the schools.

The project classes were distributed as follows: four seventh or eighth grade, thirty-five ninth grade, thirty-two tenth grade, and twenty-one in other grades or combinations of grade levels. The non-project classes were distributed as follows: seventeen in grades seven or eight, seventeen in grade nine forty-one in grade ten, and seventeen in other grades or combinations of grade levels. The frequency of project and non-project classes by grade levels and urban-suburban categories is shown in Table 5, p. 62.

Analysis of variance was performed by criterion variables for project and non-project factors (Poor and Rosenblood, 1971). Seventh and eighth grade classes were combined. No analysis was performed for grade levels eleven or twelve due to the small numbers in these categories. Grade level combinations other than seventh and eighth were not analyzed. One class per teacher was used for analysis of variance, and classes with missing data were omitted.

The two project eighth grade classes did not administer the SCACL:SP; therefore, criterion variable seventeen was not examined for seventh and eighth grade classes. Analysis of variance was not possible due to too few degrees of freedom within cells with only two project classes. A com-

TABLE 5

FREQUENCY OF CLASSES BY GRADE LEVEL, PROGRAM CLASSIFICATION AND URBAN-SUBURBAN CATEGORY

		Grade Level													
		Project							Non-project						
		7	8	9	10	11	12	0	7	8	9	10	11	12	0	Totals
Urban	1	0	4	20	22	0	2	14	6	9	15	3	1	7	126
Suburban	2	0	0	7	10	0	0	3	0	2	4	0	0	2	38
Category	3	0	0	8	0	0	0	2	0	0	0	0	0	2	20
Totals		0	4	35	32	0	2	19	6	11	19	3	1	11	184

[a]0=other, grade level combinations such as 11-12; 10-11-12, 8-9.

parison of mean scores for ten criterion variables shows that the mean scores were similar for all variables except numbers nineteen and twenty-one, SCACL:TP - Urban and Suburban composite, posttests and numbers twenty-four and twenty-five, CAI attitude and knowledge subscales, posttests. Means and standard deviations for comparing project and non-project seventh and eighth grade classes by criterion variables are shown in Table 6, p. 63.

Seven of the eleven criterion variables analyzed for ninth grade classes had a P value less than .10. Analysis of variance for comparing project and non-project ninth

TABLE 6

MEANS AND STANDARD DEVIATIONS FOR COMPARING PROJECT AND NON-PROJECT SEVENTH AND EIGHTH GRADE CLASSES BY CRITERION VARIABLES[a]

Variable Number	Project		Non-project	
	Mean	S.D.	Mean	S.D.
10.	22.00	1.41	21.86	2.04
11.	22.00	1.41	22.14	1.57
12.	22.50	0.71	23.00	2.52
14.	23.50	2.12	22.00	2.24
15.	22.00	1.41	22.14	3.19
16.	21.50	2.12	22.57	1.62
19.	53.00	5.66	50.71	4.23
21.	54.50	3.54	52.57	3.99
24.	101.50	14.85	107.43	9.96
25.	70.50	13.44	67.71	5.25

[a]N = 2 project, 7 non-project
Appendix D, p.213 provides a listing of the variables by number and name.

TABLE 7

ANALYSIS OF VARIANCE FOR COMPARING PROJECT AND NON-PROJECT NINTH GRADE CLASSES BY CRITERION VARIABLES[a]

Variable Number	F(1,17)	Mean Square	P less than	Project Mean S.D.	Non-project Mean S.D.
10.	4.39	40.74	0.05	20.75 2.42	17.71 3.95
11.	18.80	215.16	0.001	21.83 1.75	14.86 5.18
12.	4.72	38.23	0.04	21.08 2.61	18.14 3.24
14.	1.51	16.85	0.24	20.67 3.34	18.71 3.35
15.	6.87	57.15	0.02	20.17 3.14	16.57 2.57
16.	0.57	5.19	0.46	21.08 2.84	20.00 3.32
17.	11.24	126.88	0.004	36.50 3.37	31.14 3.34
19.	0.19	13.91	0.67	49.92 6.83	48.14 11.04
21.	0.02	0.28	0.90	52.25 4.07	52.00 4.58
24.	3.86	241.63	0.07	105.75 7.55	113.14 8.55
25.	3.51	75.01	0.08	73.83 4.84	69.71 4.19

[a]Observation per cell project = 12, non-project = 7
Appendix D, p. 213 provides a listing of the variables by number and name. Multivariate Analysis of Variance (Poor and Rosenblood, 1971)

TABLE 8

ANALYSIS OF VARIANCE FOR COMPARING PROJECT AND NON-PROJECT TENTH GRADE CLASSES BY CRITERION VARIABLES[a]

Variable Number	F(1,20)	Mean Square	P less than	Project Mean S.D.	Non-project Mean S.D.
10.	0.50	2.74	0.49	21.39 2.57	20.67 1.94
11.	0.95	8.74	0.34	19.62 3.15	18.33 2.87
12.	0.55	4.62	0.47	20.85 3.39	21.78 1.99
14.	2.19	13.15	0.15	21.46 2.93	19.89 1.45
15.	0.05	0.26	0.83	19.00 2.00	19.22 2.91
16.	2.36	8.06	0.14	19.77 1.42	21.00 2.35
17.	0.15	1.90	0.71	32.15 4.12	31.56 2.69
19.	0.06	1.09	0.81	52.23 4.13	52.78 4.24
21.	2.79	22.19	0.11	54.85 3.31	56.89 1.83
24.	1.61	138.01	0.22	112.54 8.94	107.44 9.74
25.	2.12	70.17	0.16	68.92 6.66	72.56 4.04

[a]Observations per cell project = 13, non-project = 9 Appendix D, p.213 provides a listing of the variables by number and name. Multivariate Analysis of Variance (Poor and Rosenblood, 1971)

grade classes by criterion variables is shown in Table 7, p. 64. None of the criterion variables examined for grade level ten had a P value less than .10 (Table 8, p. 65).

Multivariate tests of significance for comparing project and non-project ninth and tenth grade classes by criterion variables (Table 9, p. 66) gave P values of 0.12 and 0.62 for grade levels nine and ten respectively. Both values exceed .10.

TABLE 9

MULTIVARIATE TESTS OF SIGNIFICANCE FOR COMPARING PROJECT AND NON-PROJECT CLASSES BY CRITERION VARIABLES[a]

Grade Level	F	DFHYP	DFERR	P less than
9	2.43	11.00	7.00	0.12
10	0.83	11.00	10.00	0.62

[a]Multivariate Analysis of Variance (Poor and Rosenblood, 1971)

Analysis of variance for comparing male and female student teachers by criterion variables yielded no P values less than .10 for the project group (Table 10, p. 67) and one P value less than .10 for the non-project group (Table 11, p. 68). Multivariate tests of significance for comparing male and female student teachers by criterion

TABLE 10

ANALYSIS OF VARIANCE FOR COMPARING MALE AND FEMALE PROJECT STUDENT TEACHERS BY CRITERION VARIABLES[a]

Variable Number	F(1,29)	Mean Square	P less than	Male Mean S.D.	Female Mean S.D.
10.	0.004	0.02	0.95	21.14 2.37	21.20 2.39
11.	0.003	0.04	0.95	20.57 3.49	20.50 2.27
12.	0.602	5.26	0.44	20.62 3.07	21.50 2.68
14.	0.022	0.21	0.88	21.48 3.36	21.30 2.41
15.	0.001	0.01	0.97	19.67 2.99	19.70 1.06
16.	0.013	0.08	0.91	20.81 2.77	20.70 1.89
17.	0.067	1.48	0.79	34.67 4.45	34.20 5.14
19.	0.148	6.21	0.70	51.14 7.51	52.10 3.14
21.	0.213	4.34	0.65	53.00 5.01	53.80 3.12
24.	0.132	10.30	0.72	110.33 9.38	109.10 7.52
25.	0.239	8.48	0.63	70.38 5.98	71.50 5.89

[a]Observations per cell male = 21, female = 10
Appendix D, p.213 provides a listing of variables by number and name. Multivariate Analysis of Variance (Poor and Rosenblood, 1971)

TABLE 11

ANALYSIS OF VARIANCE FOR COMPARING MALE AND FEMALE NON-PROJECT STUDENT TEACHERS BY CRITERION VARIABLES[a]

Variable Number	F(1,21)	Mean Square	P less than	Male Mean S.D.	Female Mean S.D.
10.	1.01	5.16	0.33	20.41 2.06	19.33 2.81
11.	0.69	8.59	0.41	19.06 3.86	17.67 2.07
12.	0.18	1.43	0.68	21.24 2.99	20.67 2.16
14.	3.16	16.54	0.09	20.77 2.41	18.83 1.84
15.	0.68	8.12	0.42	19.35 3.32	18.00 3.85
16.	1.85	8.36	0.19	21.71 1.99	20.33 2.50
17.	0.73	8.59	0.40	33.06 3.44	31.67 3.39
19.	1.07	51.92	0.31	49.41 7.69	52.83 3.66
21.	0.03	0.58	0.86	53.47 4.16	53.83 4.79
24.	0.91	79.91	0.35	110.41 10.19	106.17 6.01
25.	0.24	5.54	0.63	70.88 4.96	72.00 4.43

[a]Observations per cell male = 17, female = 6
Appendix D, p.213 provides a listing of variables by number and name. Multivariate Analysis of Variance (Poor and Rosenblood, 1971)

variables (Table 12, p. 69) gave P values of 0.99 and 0.50 for project and non-project groups respectively. Both P values exceed .10.

TABLE 12

MULTIVARIATE TESTS OF SIGNIFICANCE FOR COMPARING MALE AND FEMALE STUDENT TEACHERS BY CRITERION VARIABLES[a]

Program Classification	F	DFHYP	DFERR	P less than
Project	0.23	11.00	19.00	0.99
Non-project	0.99	11.00	11.00	0.50

[a]Multivariate Analysis of Variance (Poor and Rosenblood, 1971)

The frequency of both program classification classes by science area and urban-suburban categories is shown in Table 13, p. 70 . The frequency of project and non-project classes using curriculum project materials by science area and by urban-suburban category is shown in Table 14, p. 71 and Table 15, p. 72 respectively.

The total number of classroom students involved was 4,194: 2,245 project and 1,949 non-project. These figures were based on instruments completed at the end of the student teacher's experience. The mean class size, based on information from 87 teachers, was 27.21. The mean class

TABLE 13

FREQUENCY OF CLASSES BY SCIENCE AREA, PROGRAM CLASSIFICATION, AND URBAN-SUBURBAN CATEGORY

		Science Area[a]															
		Project								Non-project							
		B	C	P	PS	ES	GS	O	T	B	C	P	PS	ES	GS	O	T
Urban	1	33	4	2	1	8	14	0	62	29	6	0	7	5	11	6	64
Suburban	2	10	1	0	1	0	7	1	20	10	4	0	0	0	4	0	18
Category	3	0	2	0	0	0	8	0	10	8	2	0	0	0	0	0	10
Totals		43	7	2	2	8	29	1	92	47	12	0	7	5	15	6	92

[a]B= Biology
C= Chemistry
P= Physics
PS= Physical Science
ES= Earth Science
GS= General Science
O= Other such as Life Science, Advanced Science
T= Totals

TABLE 14

FREQUENCY OF CLASSES USING CURRICULUM PROJECT MATERIALS BY SCIENCE AREA

	Science Area[a]							
	B	C	P	PS	ES	GS	O	Totals
Curriculum Project Materials	25	10	2	0	9	32	6	84
Non-Curriculum Project Materials	65	9	0	9	6	10	1	100
Totals	90	19	2	9	15	42	7	184

[a]B= Biology
C= Chemistry
P= Physics
PS= Physical Science
ES= Earth Science
GS= General Science
O= Other such as Life Science, Advanced Science

TABLE 15

FREQUENCY OF CLASSES USING CURRICULUM PROJECT MATERIALS BY PROGRAM CLASSIFICATION AND URBAN-SUBURBAN CATEGORY

		Project		Non-project	
		Curriculum Project Materials	Non-Curriculum Project Materials	Curriculum Project Materials	Non-Curriculum Project Materials
Urban	1	34	28	24	40
Suburban	2	8	12	6	12
Category	3	8	2	4	6
Totals		50	42	34	58

size by program classification and urban-suburban category is shown in Table 16, p. 73 .

The intact classroom was the unit for classroom student data collection. Both project and non-project student teachers had responsibility for a minimum of two classes in a single school. Data were collected from two classes per student teacher. In all but six cases, three project and three non-project, the student teachers taught in only one subject area. The analyses in this study were based on ninety-two classes, one per student teacher. This decision was made based on analysis of variance of randomly selected project and non-project classes (Appendix E).

TABLE 16

MEAN CLASS SIZE, STANDARD DEVIATION, AND NUMBERS BY PROGRAM CLASSIFICATION AND URBAN-SUBURBAN CATEGORY

		Project			Non-project		
		$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
Urban	1	27.97	5.09	31	26.87	4.51	30
Suburban	2	29.00	3.54	9	26.43	4.76	7
Category	3	26.20	4.55	5	26.80	4.82	5
Mean of Means		27.73	x	x	26.70	x	x

No differentiation was made between modified, regular, or advanced classes based on analyses completed by Sagness (1970).

Instrumentation

Science Classroom Activity Checklist (SCACL)

Two forms of the checklist were used. The Teacher's Perceptions (:TP) form was used with preservice teachers to assess the nature of the science classroom activities they thought should be used for classroom instruction. Preservice teachers responded to the SCACL:TP in both urban and suburban contexts.

The Student's Perceptions (:SP) form of the SCACL was

administered to classroom students. At the beginning of the quarter, the SCACL:SP was given to students who responded in terms of the cooperating teacher. Classroom students answered the SCACL:SP in terms of the student teacher at the end of the quarter.

The SCACL is an extension of work done by Kochendorfer and Lee (1966) at the University of Texas in developing a checklist for assessing the degree to which a teacher's classroom practices agreed with those thought to contribute positively toward the attainment of the Biological Science Curriculum Study objectives. The SCACL was developed, pilot tested, and used by Sagness at The Ohio State University in a 1969-70 study (Sagness, 1970). Information concerning development, validity, item analysis, reliability, and revision may be found in the Sagness report (1970). The SCACL:TP and the SCACL:SP instruments may be found in the Appendix of the Sagness report (1970). Kuder-Richardson 20 and 21 reliabilities for the teacher's perceptions and the student's perceptions forms are presented in Table 17, p. 75 . The New Item Analysis Program developed by the Office of Evaluation of The Ohio State University was used to determine reliability indices.

Seven subscales of the SCACL, referred to by letter, were: (A) Student Classroom Participation, (B) Role of the Teacher in the Classroom, (C) Use of Textbook and Reference Materials, (D) Design and Use of Tests, (E) Laboratory

TABLE 17

KUDER-RICHARDSON 20 AND 21 RELIABILITIES FOR THE REVISED SCIENCE CLASSROOM ACTIVITY CHECKLIST

Revised SCACL	1969-70 KR-20	1969-70 KR-21	1970-71 KR-20	1970-71 KR-21
Teacher's Perceptions-Urban	.75	.70	x	x
Teacher's Perceptions-Suburban	.80	.76	x	x
Student's Perceptions on the Cooperating Teachers	.77	.73	.71	.67
Student's Perceptions on the Student Teachers	.74	.71	.71	.67

Preparation, (F) Type of Laboratory Activities, and (G) Laboratory Follow-Up Activities. The composite score and subscales A-D were used in analyses in this study.

The scores on the total test and on the seven subscales were the number of right answers. Right answers were those activities considered to positively implement the general objectives of science education (Sagness, 1970). Blanks were scored as incorrect responses. Machine scored answer sheets were used. All scoring and card output for the SCACL:SP were performed by the Office of Evaluation of The Ohio State University. The SCACL:TP Urban and Suburban forms were hand scored by the investigator.

Cultural Attitude Inventory (CAI)

The CAI was developed by Dorothy Skeel (1966) and modified by McREL Regional Laboratories (Weber and Lawson, 1968). The McREL version was used in this study. The instrument provided two subscale scores. One was concerned with the respondent's attitude toward culturally deprived students. The other subscale was concerned with the respondent's knowledge of culturally deprived students. The composite score consisted of fifty items; twenty-eight items on the attitude subscale, nineteen items on the knowledge subscale, and three items on a supplementary scale. The attitudes of preservice teachers toward culturally deprived students appear to be difficult to change in a short period of time. Due to the heavy weighting of the attitude subscale on the composite score, the composite score was not used in this study. Any change in the composite score would most likely reflect a change in knowledge. The supplementary scale, consisting of items which were not categorized as assessing either attitude or knowledge, was not used. The attitude and knowledge subscales were used. Reliability estimates of the CAI ranged from .46 to .68 (Sagness, 1970). All items were scored on a five point basis with responses ranging from strongly agree to strongly disagree. All answer sheets were hand scored.

Questionnaires

Three questionnaires were used to gather information from classroom students, student teachers, and cooperating teachers. The questionnaires developed by Sagness contained questions with responses that ranged from one (like or excellent) through five (dislike or non-existent). In the scoring of responses in this study all answers marked one were assigned a value of five; all answers marked two were assigned a value of four; all answers marked three were assigned a value of three; all answers marked two were assigned a value of four; and all answers marked one were assigned a value of five. Questions were scored with like or excellent equals five and dislike or non-existent equals one.

Student Questionnaire

This instrument was developed by Sagness (1970) to collect information from individual students in the classrooms with which the student teacher worked. This form was used Autumn Quarter 1970. Due to the necessity of hand scoring large numbers of questionnaires, a machine scored form was developed and used Winter and Spring Quarters by this investigator.

The revised form (Appendix B) had four questions found on the earlier form. The last four questions were additions. The additions included questions to assess the

influence of the regular (cooperating) teacher and the attitudes of students toward the textbook and laboratory guide.

Student Teacher Questionnaire

This instrument was developed by Sagness to collect descriptive and attitudinal information from each student teacher (Sagness, 1970).

Cooperating Teacher Questionnaire

This questionnaire was developed by Sagness to collect descriptive and attitudinal information from each cooperating teacher (Sagness, 1970).

Personnel Records

Certain descriptive data were obtained from the personnel records of the College of Education. Information collected included American College Test (ACT) composite percentile score, grade point average (GPA) as of the beginning of the student teaching quarter, and the student teacher's age in years.

Checklist for Assessment of Science Teachers (CAST)

Two forms of this instrument have been developed to assess characteristics of science teachers. The three major areas assessed were: (1) student-teacher relations, (2) classroom activities, and (3) teacher's personal adjustment. The pupil's perceptions (:PP) form assessed the first two

areas; the supervisor's perceptions (:SP) form assessed all three areas.

The student-teacher relations and teacher's personal adjustment dimensions originated from a factor analysis of items compiled by Carrol Leeds (Leeds and Cook, 1947) who worked with the Minnesota Teacher Attitude Inventory. An earlier version of a Teacher Rating Scale, based on Leeds' work, was used at Oregon State University and The Ohio State University. The scale consists of 5 items which are scored from 1-5, giving a possible range of 5-25. Between 1963-1968, 120 student teachers in the biological sciences were rated: 80 by cooperating teachers and 40 of the same group by classroom students. The range of scores was 8-25 with a mean of 16.6 for the cooperating teachers' ratings. The students' ratings had a range from 10-24 with a mean of 16.3. The reliability estimates (KR-20) were .85 and .81 respectively. A 1967 follow-up of biology teachers in Oregon schools gave a KR-20 estimate of .84 when teachers were rated by principals or supervisors and .86 when rated by students. The range was 10-25 with a mean of 18.2 for the supervisors' ratings. The students' ratings had a range of 10-24 with a mean of 16.9 (Best, 1970).

In a study concerning student decision making in the secondary school biology laboratory, Best revised the student-teacher (teacher-pupil) subscale of the Teacher Rating Scale used at The Ohio State University. She

calculated a KR-20 of .82 using responses from 309 students (Best, 1970).

The section concerning classroom activities was developed by selecting items from the Science Classroom Activity Checklist (SCACL) used in the Spring Quarter 1970 at The Ohio State University. Student perceptions by 1,243 students on cooperating teachers gave a KR-20 estimate of .79.

The SCACL was developed from the Biology Classroom Activity Checklist by Kochendorfer and Lee at the University of Texas to be used to check BSCS classes (Kochendorfer, 1966). This instrument has been used extensively in various forms. The seven subsections of the SCACL reflect laboratory oriented, inquiry, student involvement, and open approaches to teaching science. This philosophy was carried to the development of the CAST.

In the development of the pupil's form, careful attention was given to readability. Two readability tests were conducted, the Dale and Chall (1948) and The Flesch (1949). A Flesch scale score was computed by using the number of syllables per 100 words and the average sentence length. The Dale and Chall index was computed by using the number of words not on a list of 3,000 familiar words and the average sentence length. The Flesch score converted to grade level 7 for the entire instrument and the Dale and Chall score converted to grade level 5-6.

The reliability of the CAST was computed by the use of The New Item Analysis Program developed by the Office of Evaluation of The Ohio State University. A KR-20 of .74 and a KR-21 of .71 were obtained for the CAST:PP with 327 students.

The CAST:SP was used with cooperating teachers and university supervisors Autumn, Winter, and Spring Quarters. The CAST:PP was used Winter and Spring Quarters on a pilot basis with fifteen cooperating teachers and fifteen student teachers.

Validity of the CAST was obtained by submitting the supervisor's form to eleven graduate students at the Ph.D. level and professors in science education at The Ohio State University. The five responses to each of the fifteen questions were in random order. The raters placed the five responses in order from one through five with one being most desirable and five being least desirable based on the philosophy of the individual members of the Faculty of Science and Mathematics Education at The Ohio State University. Program BMDO2V -- Analysis of Variance for Factorial Design (Dixon, 1970) was used to obtain the variance for the raters and the residual with the number of raters as twelve (twelve science educators including the investigator). A procedure to obtain intraclass correlation and the intraclass correlation of the mean of the ratings was used (Guildford, 1965). The intraclass correlations are shown in Table 18,

TABLE 18

INTRACLASS CORRELATION AND INTRACLASS CORRELATION OF THE SUM OF THE RATINGS FOR THE CHECKLIST FOR ASSESSMENT OF SCIENCE TEACHERS

Questions	r_{cc}[a]	r_{kk}
1. Teacher's disciplinary ability	.78	.98
2. Student or subject matter point of view	.94	.99
3. Teacher's attitude toward adolescents	.86	.99
4. Teacher understand behavior problems	.76	.97
5. Attitude of students toward teacher	.96	.99
6. Student's role in class	.98	.99
7. Teacher's role in class	.80	.94
8. Use of textbook and reference materials	.88	.99
9. Design and use of tests	.89	.99
10. Conduction of laboratory	.93	.99
11. Teacher analytical thinking	.53	.93
12. Teacher social attitudes	.98	.99
13. Teacher emotional attitudes	.97	.98
14. Teacher self-confidence	.86	.99
15. Teacher personal relations	.86	.99

[a]Intraclass Correlation:

$$r_{cc} = \frac{V_r - V_e}{V_r + (k-1)V_e}$$

Intraclass Correlation of the Sum of the Ratings:

$$r_{kk} = \frac{V_r - V_e}{V_r}$$

V_r= variance between rows, where each row stands for a person (ratee)
V_e= variance for residuals or error
k = number of columns (raters)

p. 82 . Copies of the originals of both forms of the instrument may be found in Appendix A.

Data Collection Procedures

The sequence of data collection is shown in Figure 1, p. 84 . The procedures for data collection were the same for all quarters of the study. All data collections were accomplished by the use of paper and pencil instruments.

First Professional Quarter

Data were collected from the preservice teachers in a group situation during the first week of the quarter for the pretests and during the last week of the quarter for the posttests. The time required for data collection was approximately one hour each collection.

The SCACL:TP was the first instrument administered. The preservice teachers responded to the entire instrument twice; first according to the nature of science classroom activities which they thought should be used in an urban context and second according to activities to be used in a suburban context. They were requested to respond to the instrument in entirety, focusing on one environmental setting and then responding to the second setting without reference to the first. The individual was assigned which context he was to respond to first and which one second by means of a code on the answer sheet. Half the students responded urban, then suburban; half answered suburban, then urban.

FIGURE 1

SEQUENCE OF DATA COLLECTION

	Quarter[a]					
	Autumn		Winter		Spring	
	Pre	Post	Pre	Post	Pre	Post
Preservice Teacher						
A. SCACL:TP-U	1,4	1,4	2,5	2,4,5	3	3,5
B. SCACL:TP-S	1,4	1,4	2,5	2,4,5	3	3,5
C. CAI	1,4	1,4	2,5	2,4,5	3	3,5
D. Questionnaire		1		2,4		3,5
E. Descriptive Data		1		2,4		3,5
Cooperating Teacher						
A. Questionnaire		1		2,4		3,5
B. CAST:SP		1		2,4		3,5
Classroom Students						
A. SCACL:SP on Coop. Teacher	1		2,4		3,5	
B. SCACL:SP on Stud. Teacher		1		2,4		3,5
C. Questionnaire		1		2,4		3,5
D. CAST:PP on Coop. Teacher(Pilot)			2,4		2,4	
E. CAST:PP on Stud. Teacher(Pilot)				2,4		3,5
University Supervisor						
A. CAST:SP		1		2,4		3,5

[a]Non-project Student Teacher:
Group
1= Autumn
2= Winter
3= Spring

Project S_1 and S_2:
Group
4= Autumn and Winter
5= Winter and Spring

Answer sheets were distributed randomly to the preservice teachers. The S_1 student was to define urban and suburban from his own experiences. No cues were provided in directions given to the preservice teachers. The classes were viewed as regular classes, not as modified or advanced. This procedure was followed for both pretest and posttest administration of the SCACL:TP to preservice teachers.

The Cultural Attitude Inventory (CAI) was administered at the beginning and end of the S_1 quarter. It was given following the SCACL:TP. No specific directions other than those accompanying the inventory were provided.

The S_1 posttest of the CAI and the SCACL:TP served as the S_2 pretest. A maximum of three weeks separated the end of the S_1 experience and the onset of the S_2 quarter.

Student Teaching Quarter

Data from project student teachers

The S_2 pretest scores were collected during the S_1 quarter. Therefore, no data were collected from S_2 students at the beginning of their student teaching experience.

Posttest data were collected for the SCACL:TP-U, SCACL:TP-S, and the CAI following the procedure outlined for the S_1 quarter. The S_2 student teacher completed a Student Teacher Questionnaire at the end of the S_2 quarter. The investigator gathered descriptive data from the College of Education Office near the end of the student teaching

quarter.

Data from non-project student teachers

The SCACL:TP-U, SCACL:TP-S, and the CAI were administered as pretests following the procedure outlined for project preservice teachers during their S_1 quarter. The non-project posttest data collection paralleled that of the project student teachers.

Data from cooperating teachers

Data were collected from cooperating teachers at the end of the quarter in which they worked with student teachers. The cooperating teacher completed a Cooperating Teacher Questionnaire and the CAST:SP. A manual describing the CAST and directions for its administration were provided each cooperating teacher. A packet of materials was delivered to each cooperating teacher by the investigator following a letter specifying that instruments would be delivered to the schools. All cooperating teachers were contacted by letter and/or in person prior to their working with a student teacher. The investigator picked up all materials from cooperating teachers after they had been completed. Feedback was sent to all cooperating teachers at the end of the quarter during which they had worked with a student teacher.

Data from classroom students

The SCACL:SP was completed twice by each student in two of the classes with which the student teacher worked.

The first collection of classroom student checklist data was performed during the first two weeks of the student teaching quarter. The classroom students stated their perceptions of the science classroom activities which their regular (cooperating) teacher used for classroom instruction. All responses were recorded on machine scored answer sheets. No student names or code symbols keyed to names were placed on any student answer sheets. Students were assured that their responses would be anonymous and that they were not evaluating their teacher.

The data collection instruments were delivered to the schools by the researcher a few days prior to the time the data were to be collected. This procedure allowed the cooperating teacher time to schedule the data collection. Instruments were not given in all schools on the same day. This procedure was followed as it was not possible to schedule simultaneous administration due to possible conflicting activities in any given school on a particular day.

Dates were specified when the investigator would return to the schools to pick up the data. The procedure of initial contact by letter and personal delivery and pick up of instruments was followed in order to effect personal contact between the investigator and the classroom teacher.

Personal feedback was provided during the quarter in which the cooperating teacher worked with a student teacher in order to foster involvement of teachers in this research.

The procedures for the second data collection were essentially the same as those described for the beginning of the quarter. The differences were: (1) classroom students gave their perceptions of the science activities which the student teacher used in his instruction, (2) the student teacher administered the instruments rather than the cooperating teacher, and (3) the pupils completed a questionnaire.

The procedure followed for Winter Quarter and Spring Quarter pilot testing of the CAST:PP was the same as for the SCACL:SP except that classroom students did not complete a questionnaire. Eight cooperating teachers were chosen Winter Quarter and seven Spring Quarter. Cooperating teachers were chosen on the basis of urban-suburban category and project, non-project classification (Table 19, p. 89).

Data from university supervisors

Graduate students and professors in science education at The Ohio State University completed the CAST:SP in terms of the student teacher they supervised. The CAST:SP was completed by the supervisors during the final two weeks of the student teaching quarter. Both project and non-project supervisors completed identical instruments.

TABLE 19

FREQUENCY OF COOPERATING AND STUDENT TEACHERS WHO USED THE PILOT CAST:PP BY PROGRAM CLASSIFICATION AND URBAN-SUBURBAN CATEGORY

		Program Classification		
		Project	Non-project	Totals
Urban	1	7	4	11
Suburban	2	1	2	3
Category	3	1	0	1
Totals		9	6	15

Statistical Analysis

The statistical analysis procedures and programs used for the analysis of the problems and hypotheses of this study were the following: (1) Hypotheses involving the analysis of pretest-posttest within group differences were tested using the t-test for testing differences in means which was accomplished by the use of the computer terminal (Shumway, 1970) and a computerized BMD-01D Simple Data Description Program developed by the Health Sciences Computing Facility at the University of California at Los Angeles (Dixon, 1970). The calculational formula is:

$$t = \frac{(\bar{X}_1 - \bar{X}_2)}{\sqrt{\frac{S^2}{N_1} + \frac{S^2}{N_2}}} \quad \text{with } N_1 + N_2 - 2 \text{ degrees of freedom,}$$

$$\text{where } S^2 = \frac{N_1 S_1^2 + N_2 S_2^2}{N_1 + N_2 - 2}$$

and N_1 and N_2 = sample size

S_1 and S_2 = standard deviations

M_1 and M_2 = sample means.

(2) Hypotheses involving the analysis of posttest differences between the project and non-project groups were tested using a Multivariate Analysis of Variance Program (Poor and Rosenblood, 1971). (3) Chi square was computed for the university supervisors' ratings of student teachers' subscale

A scores : the CAST:SP (Wert, 1954). The computational formula i

$$= \sum \left[\frac{(\text{Actual Frequency} - \text{Expected Frequency})^2}{\text{Expected Frequency}} \right]$$

(4) If within group (project or non-project) or between group differences existed, correlations were obtained using a computerized BMD-03D Correlation with Item Deletion Program (Dixon, 1970). The Pearson product-moment coefficient of correlation is obtained by solving the formula (Wert, 1954):

$$r_{xy} = \frac{\Sigma xy}{N \sigma_x \sigma_y}$$

where r_{xy} = coefficient of correlation

Σxy = sum of the products of the paired scores expressed in deviation form

N = number of cases

σ_x and σ_y = standard deviations in two distributions

(5) To further define the relationships among selected variables, a computerized BMD-02R Stepwise Regression Program was used (Dixon, 1970). Cases with missing data were not used in regression. The variable that accounted for the greatest per cent of the variance was removed and the regressions were run with this variable eliminated.

CHAPTER IV

ANALYSIS

The results of the study are presented in this chapter. The results for each hypothesis are discussed in the order they were presented in Chapter I. Significance levels are reported as .10, .05, or .01. Values that were significant beyond the .01 level are reported at .01. Analysis of Problem 1 is presented first. If no significant change occurred in terms of criterion variables for Problem 1, the hypotheses were not rejected, and the hypotheses listed for Problem 2 pertaining to the same criterion variables were not pursued. Interrelationships pertaining to hypotheses for Problem 2 are reported only if significant pre to post change has occurred or if there are significant differences between project and non-project groups. Hypotheses for Problem 2 were not categorically rejected or not rejected. Negative t values indicate gains from pre- to posttest. Positive t values indicate lower scores on the posttest than on the pretest.

First Professional Quarter

Problem 1.

Problem 1 was to compare the influence, in terms of criterion variables, of two science education programs for preservice science teachers. The following hypotheses were investigated in terms of the project (S_1) group only.

Hypothesis 1.

Preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for urban classroom science instruction at the completion of the first professional quarter experience.

A t value of -4.34 was determined in testing this hypothesis. This value was significant at the .01 level with an increase in scores from pre- to posttest. This hypothesis was rejected (Table 20, p. 94).

Hypothesis 2.

Preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for suburban classroom instruction at the completion of the first professional quarter experience.

A t value of -2.46 was determined in testing this hypothesis. This value was significant at the .05 level;

TABLE 20

TWO SAMPLE t FOR TESTING DIFFERENCES IN MEANS FOR COMPARING FIRST PROFESSIONAL QUARTER PRESERVICE TEACHER PRE AND POSTTEST SCORES

Variable	Mean	S.D.	N	t value[a]	Significance
SCACL:TP-U Composite, Pre	44.98	6.48	48		
				-4.34	.01
SCACL:TP-U Composite, Post	50.31	5.38	48		
SCACL:TP-S Composite, Pre	50.50	3.94	48		
				-2.46	.05
SCACL:TP-S Composite, Post	52.38	3.46	48		
CAI-Attitude Subscale, Pre	108.06	8.35	48		
				-1.34	N.S.
CAI-Attitude Subscale, Post	110.15	6.64	48		
CAI-Knowledge Subscale, Pre	70.33	5.24	48		
				0.48	N.S.
CAI-Knowledge Subscale, Post	69.81	5.24	48		

[a] $t \geq 1.66$ to be significant at .10 level
$t \geq 1.99$ to be significant at .05 level
$t \geq 2.63$ to be significant at .01 level
$df = 94$

therefore, this hypothesis was rejected (Table 20, p. 94). There was an increase in scores from pre- to posttest.

Hypothesis 3.

Preservice teachers will not have changed significantly in their attitudes toward culturally deprived students at the completion of the first professional quarter experience.

A t value of -1.34 was determined in testing this hypothesis. This value was not significant at the .10 level although there was an increase in scores from pre- to posttest. This hypothesis was not rejected (Table 20, p. 94).

Hypothesis 4.

Preservice teachers will not have changed significantly in their knowledge of culturally deprived students at the completion of the first professional quarter experience.

A t value of 0.48 was determined in testing this hypothesis. This value was not significant at the .10 level; therefore, this hypothesis was not rejected (Table 20, p. 94). There was a decrease in scores from pre- to posttest.

Problem 2.

Problem 2 was to investigate the interrelationships of selected variables with the criterion variables. Cases with missing data were omitted from regression analysis.

Hypothesis 1.

There are no significant relationships between selected

preservice teacher variables and the preservice teachers' views of the types of classroom activities they think should be used for science instruction in an urban setting.

Several variables correlated with the preservice teachers' initial views (pretest) of the types of classroom activities they think should be used for science instruction in an urban setting. These variables were four subscales of the SCACL:TP-U pretest (variables 2,3,4,5), the composite posttest score on the same measure (variable 6), the composite and subscale A scores on the SCACL:TP-S pretest (variables 7,8), and the SCACL:TP-S composite posttest score (variable 11) (Table 21, p. 97).

Correlates with the first professional quarter posttest views of the types of classroom activities preservice teachers think should be used in an urban setting were the composite and four subscale scores on the SCACL:TP-U pretest (variables 1,2,3,4,5), the composite and subscale A scores on the SCACL:TP-S pretest (variables 7,8), and the composite score on the SCACL:TP-S posttest (variable 11) (Table 22, p. 98).

All the correlations for both the pre- and posttest composite scores for the SCACL:TP-U involved either subscales of the same instrument or scores on the related suburban measure. The best predictor of posttest composite scores on the SCACL:TP-U was the composite scores on the SCACL:TP-S posttest. This factor accounted for 99 per cent

TABLE 21

SIGNIFICANT CORRELATIONS OF FIRST PROFESSIONAL QUARTER PRESERVICE TEACHER VARIABLES WITH THE SCACL:TP-URBAN COMPOSITE PRETEST

Variable Number	Variable Description	Correlation Coefficient	Significance Level
2.	SCACL:TP-U Subscale A, Pre	.748	.01[a]
3.	SCACL:TP-U Subscale B, Pre	.514	.01
4.	SCACL:TP-U Subscale C, Pre	.637	.01
5.	SCACL:TP-U Subscale D, Pre	.676	.01
6.	SCACL:TP-U Composite, Post	.692	.01
7.	SCACL:TP-S Composite, Pre	.373	.01
8.	SCACL:TP-S Subscale A, Pre	.304	.05
11.	SCACL:TP-S Composite, Post	.467	.01

[a]Significance level .05 ≥ .284
Significance level .01 ≥ .368
Number = 48

TABLE 22

SIGNIFICANT CORRELATIONS OF FIRST PROFESSIONAL QUARTER PRESERVICE TEACHER VARIABLES WITH THE SCACL:TP-URBAN COMPOSITE POSTTEST

Variable Number	Variable Description	Correlation Coefficient	Significance Level
1.	SCACL:TP-U Composite, Pre	.692	.01[a]
2.	SCACL:TP-U Subscale A, Pre	.484	.01
3.	SCACL:TP-U Subscale B, Pre	.425	.01
4.	SCACL:TP-U Subscale C, Pre	.438	.01
5.	SCACL:TP-U Subscale D, Pre	.557	.01
7.	SCACL:TP-S Composite, Pre	.505	.01
8.	SCACL:TP-S Subscale A, Pre	.326	.05
11.	SCACL:TP-S Composite, Post	.751	.01

[a]Significance level .05 $\geq$ .284
Significance level .01 $\geq$ .368
Number = 48

of the variance (Table 23, p. 100). When the SCACL:TP-S composite posttest score was removed from the regression program, the SCACL:TP-S composite pretest was the best predictor of the composite score on the SCACL:TP-U composite posttest. This factor accounted for 99 per cent of the variance (Table 24, p. 100).

Hypothesis 2.

There are no significant relationships between selected preservice teacher variables and the preservice teachers' views of the types of classroom activities they think should be used for science instruction in a suburban setting.

The composite, subscale A, and subscale D scores on the SCACL:TP-U pretest (variables 1,2,5) correlated with the SCACL:TP-S composite pretest. Additional SCACL correlates with the SCACL:TP-S composite pretest were the urban composite posttest (variable 6), subscales A and B on the suburban pretest (variables 8,9), and the composite score on the suburban posttest (variable 11). The ACT composite percentile scores (variable 16) also correlated with the preservice teachers' initial views of the types of classroom activities they think should be used for science instruction in a suburban setting (Table 25, p. 101).

Correlations with the SCACL:TP-S composite posttest involved SCACL scores only. These correlations were the composite and subscales A, B, and D scores for the urban

TABLE 23

REGRESSION ANALYSIS OF FIRST PROFESSIONAL QUARTER PRESERVICE TEACHER VARIABLES WITH THE SCACL:TP-URBAN COMPOSITE POSTTEST[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	11	0.9990	0.9980	0.9980
2	10	0.9992	0.9984	0.0004
3	15	0.9993	0.9986	0.0002

[a]N = 29. All first professional quarter variables were entered into the regression program.
Appendix D, p.213 provides a listing of the variables by number and name.

TABLE 24

STEPWISE ELIMINATION REGRESSION ANALYSIS OF FIRST PROFESSIONAL QUARTER PRESERVICE TEACHER VARIABLES WITH THE SCACL:TP-URBAN COMPOSITE POSTTEST[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	7	0.9966	0.9932	0.9932
2	1	0.9976	0.9952	0.0020
3	3	0.9977	0.9955	0.0003

[a]N = 29. Variable number 11 was removed in this stepwise elimination. All other first professional quarter variables were entered into the regression program.
Appendix D, p.213 provides a listing of the variables by number and name.

TABLE 25

SIGNIFICANT CORRELATIONS OF FIRST PROFESSIONAL QUARTER PRESERVICE TEACHER VARIABLES WITH THE SCACL:TP-SUBURBAN COMPOSITE POSTTEST

Variable Number	Variable Description	Correlation Coefficient	Significance Level
1.	SCACL:TP-U Composite, Pre	.373	.01[a]
2.	SCACL:TP-U Subscale A, Pre	.346	.05
5.	SCACL:TP-U Subscale D, Pre	.394	.01
6.	SCACL:TP-U Composite, Post	.505	.01
8.	SCACL:TP-S Subscale A, Pre	.636	.01
9.	SCACL:TP-S Subscale B, Pre	.447	.01
11.	SCACL:TP-S Composite, Post	.651	.01
16.	ACT Composite Percentile Score	.372	.05

[a]Significance level .05 ≥ .284
Significance level .01 ≥ .368
Number = 48 except for variable 16 where N = 30
(Sig. level .05 ≥ .361)

pretest (variables 1,2,3,5), the urban composite posttest (variable 6), and the composite and subscale A scores on the suburban pretest (variables 7,8) (Table 26, p. 103). The best predictor of posttest composite scores on the SCACL:TP-S was the SCACL:TP-U composite posttest score. This factor accounted for 99 per cent of the variance (Table 27, p. 104). When the SCACL:TP-U composite posttest score was eliminated from the regression program, the SCACL:TP-S composite pretest was the best predictor of the posttest composite score on the SCACL:TP-S. This factor accounted for 99 per cent of the variance (Table 28, p. 104).

Hypothesis 3.

There are no significant relationships between selected preservice teacher variables and the student teachers' attitudes toward culturally deprived students.

Preservice teachers did not change significantly in their attitudes toward culturally deprived students at the completion of the first professional quarter experience. Since hypothesis 3 of Problem 1 was not rejected, interrelationships of selected variables with the Cultural Attitude Inventory (CAI) attitude subscale are not reported.

Hypothesis 4.

There are no significant relationships between selected preservice teacher variables and the preservice teachers' knowledge of culturally deprived students.

TABLE 26

SIGNIFICANT CORRELATIONS OF FIRST PROFESSIONAL QUARTER PRESERVICE TEACHER VARIABLES WITH THE SCACL:TP-SUBURBAN COMPOSITE POSTTEST

Variable Number	Variable Description	Correlation Coefficient	Significance Level
1.	SCACL:TP-U Composite, Pre	.467	.01[a]
2.	SCACL:TP-U Subscale A, Pre	.314	.05
3.	SCACL:TP-U Subscale B, Pre	.298	.05
5.	SCACL:TP-U Subscale D, Pre	.349	.05
6.	SCACL:TP-U Composite, Post	.751	.01
7.	SCACL:TP-S Composite, Pre	.651	.01
8.	SCACL:TP-S Subscale A, Pre	.450	.01

[a]Significance level .05 $\geq$ .284
Significance level .01 $\geq$ .368
Number = 48

TABLE 27

REGRESSION ANALYSIS OF FIRST PROFESSIONAL QUARTER PRESERVICE TEACHER VARIABLES WITH THE SCACL:TP-SUBURBAN COMPOSITE POSTTEST[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	6	0.9990	0.9980	0.9980
2	10	0.9995	0.9990	0.0010
3	14	0.9996	0.9992	0.0002

[a]N = 29. All first professional quarter variables were entered into the regression program.
Appendix D, p.213 provides a listing of the variables by number and name.

TABLE 28

STEPWISE ELIMINATION REGRESSION ANALYSIS OF FIRST PROFESSIONAL QUARTER PRESERVICE TEACHER VARIABLES WITH THE SCACL:TP-SUBURBAN COMPOSITE POSTTEST[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	7	0.9979	0.9959	0.9959
2	4	0.9985	0.9969	0.0010
3	3	0.9987	0.9974	0.0005

[a]N = 29. Variable number 6 was removed in this stepwise elimination. All other first professional quarter variables were entered into the regression program.
Appendix D, p.213 provides a listing of the variables by number and name.

Preservice teachers did not change significantly in their knowledge of culturally deprived students at the completion of the first professional quarter experience. Since hypothesis 4 of Problem 1 was not rejected, interrelationships of selected variables with the CAI knowledge subscale are not reported.

Summary of the First Professional Quarter

Preservice teachers changed their views significantly (increase in scores pre to post) about the types of science classroom activities which should be used for urban or suburban classroom science instruction. All significant correlations were positive. The correlations involved SCACL:TP scores with the exception of a correlation between the SCACL:TP-S composite pretest score and the S_1 students' ACT composite percentile scores. The best predictor of SCACL:TP-S scores was the SCACL:TP-U scores and vice versa.

Preservice S_1 teachers did not change significantly in their attitudes toward or in their knowledge of culturally deprived students at the completion of the first professional quarter experience.

Student Teaching Quarter

Problem 1 -- Project

Problem 1 was to compare the influence, in terms of criterion variables, of two science education programs for

preservice science teachers. The following hypotheses were investigated in terms of the project group.

Hypothesis 1.

Project preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for urban classroom science instruction at the completion of the student teaching quarter.

A t value of -1.24 was determined in testing this hypothesis for the pre- and posttest scores for the S_2 quarter. This value was not significant at the .10 level although there was an increase in scores from pre- to posttest (Table 29, p. 107). A t value of -5.36 was determined in testing this hypothesis for the pre S_1 and the post S_2 scores. This value was significant at the .01 level with an increase in scores from pre- to posttest (Table 30, p. 108). This hypothesis was rejected based on the significant change that occurred from pre S_1 to post S_2 scores.

Hypothesis 2.

Project preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for suburban classroom science instruction at the completion of the student teaching quarter.

A t value of -0.90 was determined in testing this

TABLE 29

TWO SAMPLE t FOR TESTING DIFFERENCES IN MEANS FOR COMPARING STUDENT TEACHING QUARTER PROJECT PRESERVICE TEACHER PRE- AND POSTTEST SCORES

Variable	Mean	S.D.	N	t value[a]	Significance
SCACL:TP-U Composite, Pre	50.31	5.38	48		
SCACL:TP-U Composite, Post	51.72	5.53	46	-1.24	N.S.
SCACL:TP-S Composite, Pre	52.38	3.46	48		
SCACL:TP-S Composite, Post	53.09	4.09	46	-0.90	N.S.
CAI-Attitude Subscale, Pre	110.15	6.64	48		
CAI-Attitude Subscale, Post	109.30	8.03	46	0.55	N.S.
CAI-Knowledge Subscale, Pre	69.81	5.24	48		
CAI-Knowledge Subscale, Post	70.46	5.51	46	-0.58	N.S.

[a] $t \geq 1.66$ to be significant at .10 level
$t \geq 1.99$ to be significant at .05 level
$t \geq 2.63$ to be significant at .01 level
$df = 92$

TABLE 30

TWO SAMPLE t FOR TESTING DIFFERENCES IN MEANS FOR COMPARING PROJECT PRESERVICE TEACHER PRE S_1 AND POST S_2 SCORES

Variable	Mean	S.D.	N	t value[a]	Significance
SCACL:TP-U Composite, Pre S_1	44.98	6.48	48		
				-5.36	.01
SCACL:TP-U Composite, Post S_2	51.72	5.53	46		
SCACL:TP-S Composite, Pre S_1	50.50	3.94	48		
				-3.09	.01
SCACL:TP-S Composite, Post S_2	53.09	4.09	46		
CAI-Attitude Subscale, Pre S_1	108.06	8.35	48		
				-0.73	N.S.
CAI-Attitude Subscale, Post S_2	109.30	8.03	46		
CAI-Knowledge Subscale, Pre S_1	70.33	5.24	48		
				-0.12	N.S.
CAI-Knowledge Subscale, Post S_2	70.46	5.51	46		

[a] $t \geq 1.66$ to be significant at .10 level
$t \geq 1.99$ to be significant at .05 level
$t \geq 2.63$ to be significant at .01 level
df = 92

hypothesis for the pre- and posttest scores for the S_2 quarter. This value was not significant at the .10 level although there was an increase in scores from pre- to posttest (Table 29, p. 107). A t value of -3.09 was determined in testing this hypothesis for the pre S_1 and post S_2 scores. This value was significant at the .01 level with an increase in scores from pre- to posttest (Table 30, p. 108). This hypothesis was rejected based on the significant change that occurred from pre S_1 to post S_2 scores.

Hypothesis 3.

Project preservice teachers will not have changed significantly in their attitudes toward culturally deprived students at the completion of the student teaching quarter.

A t value of 0.55 was determined in testing this hypothesis for the pre- and posttest scores for the S_2 quarter. This value was not significant at the .10 level (Table 29, p. 107). There was a decrease in scores from pre- to posttest. A t value of -0.73 was determined in testing this hypothesis for the pre S_1 and post S_2 scores. This value was not significant at the .10 level although there was an increase in scores from pre- to posttest (Table 30, p. 108). This hypothesis was not rejected.

Hypothesis 4.

Project preservice teachers will not have changed significantly in their knowledge of culturally deprived students

at the completion of the student teaching quarter.

A t value of -0.58 was determined in testing this hypothesis for the pre- and posttest scores for the S_2 quarter. This value was not significant at the .10 level although there was an increase in scores from pre- to posttest (Table 29, p. 107). A t value -0.12 was determined in testing this hypothesis for the pre S_1 and post S_2 scores. This value was not significant at the .10 level although there was an increase in scores from pre- to posttest (Table 30, p. 108). This hypothesis was not rejected.

Problem 1. Non-project

The following hypotheses were investigated in terms of the non-project group.

Hypothesis 1.

Non-project preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for urban classroom science instruction at the completion of the student teaching quarter.

A t value of -1.00 was determined in testing this hypothesis. This value was not significant at the .10 level; therefore, this hypothesis was not rejected (Table 31, p. 111). There was an increase in scores from pre- to posttest.

TABLE 31

TWO SAMPLE t FOR TESTING DIFFERENCES IN MEANS
FOR COMPARING STUDENT TEACHING QUARTER
NON-PROJECT PRESERVICE TEACHER
PRE- AND POSTTEST SCORES

Variable	Mean	S.D.	N	t value[a]	Significance
SCACL:TP-U Composite, Pre	50.41	6.31	46		
				-1.00	N.S.
SCACL:TP-U Composite, Post	51.69	5.75	45		
SCACL:TP-S Composite, Pre	53.93	3.68	46		
				-0.86	N.S.
SCACL:TP-S Composite, Post	54.89	6.53	45		
CAI-Attitude Subscale, Pre	108.43	8.38	46		
				0.15	N.S.
CAI-Attitude Subscale, Post	108.15	8.99	46		
CAI-Knowledge Subscale, Pre	69.65	5.49	46		
				-0.50	N.S.
CAI-Knowledge Subscale, Post	70.19	4.72	46		

[a] $t \geq 1.66$ to be significant at .10 level
$t \geq 1.99$ to be significant at .05 level
$t \geq 2.64$ to be significant at .01 level
$df = 89$

Hypothesis 2.

Non-project preservice teachers will not have changed their views significantly about the types of science classroom activities which should be used for suburban classroom science instruction at the completion of the student teaching quarter.

A t value of -0.86 was determined in testing this hypothesis. This value was not significant at the .10 level although there was an increase in scores from pre- to posttest. This hypothesis was not rejected (Table 31, p. 111).

Hypothesis 3.

Non-project preservice teachers will not have changed significantly in their attitudes toward culturally deprived students at the completion of the student teaching quarter.

A t value of 0.15 was determined in testing this hypothesis. This value was not significant at the .10 level. This hypothesis was not rejected (Table 31, p. 111). There was a slight decrease in scores from pre- to posttest.

Hypothesis 4.

Non-project preservice teachers will not have changed significantly in their knowledge of culturally deprived students at the completion of the student teaching quarter.

A t value of -0.50 was determined in testing this hypothesis. This value was not significant at the .10 level;

therefore, this hypothesis was not rejected (Table 31, p. 111). There was an increase in scores from pre- to post-test.

Summary of Problem 1. Project and Non-project

Project student teachers changed significantly (pre S_1 to post S_2) in their views of the types of science classroom activities which should be used for science instruction in urban or suburban classrooms. There was no significant change in the non-project group on the same measures.

Neither the project nor the non-project groups changed significantly in their attitudes toward or in their knowledge of culturally deprived students.

Problem 2. Project and Non-project

Problem 2 was to investigate the interrelationships of selected variables with the criterion variables. Correlation tables presented in this section show significant correlations for both the project and non-project groups. Significance levels are reported as .10, .05, or .01. Values that were significant beyond the .01 level are reported at .01. Discussion is presented only for the program group (project or non-project) for which significant pre to post change occurred or when there was a significant difference between groups. All correlations are positive unless specified as negative. Cases with missing data were omitted from regression analysis.

Hypotheses 1 - 12 may be combined into four groups of three hypotheses each. The first hypothesis in the series of three deals with student teacher variables (variables 6 to 25), the second hypothesis deals with cooperating teacher variables (variables 26 to 35), and the third hypothesis deals with classroom student variables (variables 1 to 5). The four groups of hypotheses and the instruments used to test them are:

Hypotheses 1 - 3 : SCACL:TP-Urban

Hypotheses 4 - 6 : SCACL:TP-Suburban

Hypotheses 7 - 9 : CAI - Attitude Subscale

Hypotheses 10 - 12: CAI - Knowledge Subscale

Interrelationships are discussed for hypotheses 1 - 12 only if significant pre to post change occurred as reported in the previous section of this chapter (pp. 105-113).

Hypotheses 13 - 21 may also be combined into three groups of three hypotheses each (student teacher, cooperating teacher, and classroom student variables). The three groups of hypotheses and the instruments used to test them are:

Hypotheses 13 - 15: SCACL:SP and CAST:SP-B

Hypotheses 16 - 18: CAST:SP-A

Hypotheses 19 - 21: CAST:SP-C

Interrelationships are discussed for hypotheses 13 - 21 only if there were significant differences between the project and non-project groups as reported in the third section

of this chapter (First Professional Quarter and Student Teaching Quarter, pp. 154-159).

Interrelationships for pilot measures (variables 38 to 41) are reported following each series of three hypotheses, and a summary follows each set of three hypotheses. Appendix D, p.213 provides a listing of the variables by number and name.

Hypotheses 1 - 3

Hypothesis 1.

There are no significant relationships between selected student teacher variables and the student teachers' views of the types of activities which should be used for science instruction in an urban setting.

Correlates with the SCACL:TP-Urban pretest and posttest for the project group were the student teachers' attitudes toward their classes of secondary students (variable 6), the composite and subscale A scores on the CAST:SP completed by the university supervisor (variables 13,14,, and the pre- and posttest composite scores on the SCACL:TP-S (variables 20,21). The pretest SCACL:TP-Urban composite score (variable 18) correlated with the posttest measure on the same instrument (variable 19). The SCACL:TP-Urban composite posttest correlated with the subscale B of the CAST:SP completed by the university supervisor (variable 15). Correlations for pre- and posttest scores are shown in Table 32, p. 117

and Table 33, p.118 respectively. The best predictor of the pretest score on the SCACL:TP-U was the SCACL:TP-S composite pretest (Table 34, p. 119). This factor accounted for 99 per cent of the variance. When the SCACL:TP-S composite pretest score was eliminated from the regression program, the SCACL:TP-U composite posttest was the best predictor of the SCACL:TP-U composite pretest. This factor accounted for 99 per cent of the variance (Table 35, p. 119). The SCACL:TP-U composite pretest was the best predictor of the SCACL:TP-U posttest composite score (Table 36, p. 120). This factor accounted for 99 per cent of the variance. When the SCACL:TP-U composite pretest score was eliminated from the regression program, the student teachers' attitudes toward their classes was the best predictor of the SCACL:TP-U composite posttest. This factor accounted for 99 per cent of the variance (Table 37, p. 120).

There were no significant pre to post changes for the non-project group; therefore, no interrelationships are discussed for this group.

Hypothesis 2.

There are no significant relationships between selected cooperating teacher variables and the student teachers' views of the types of activities which should be used for science instruction in an urban setting.

There were no significant correlations between

TABLE 32

SIGNIFICANT CORRELATIONS OF STUDENT TEACHING QUARTER PROJECT AND NON-PROJECT PRESERVICE TEACHER VARIABLES WITH THE SCACL:TP-URBAN COMPOSITE PRETEST[a]

Variable Number	Variable Description	Project		Non-project	
		r	Sig.	r	Sig.
6.	Student teacher att. to class	.359 (45)	.05	x	x
13.	CAST:SP-composite by univ. super.	.305 (45)	.05	x	x
14.	CAST:SP-A by univ. super.	.373 (45)	.05	x	x
19.	SCACL:TP-U composite, post	.616 (45)	.01	.579 (45)	.01
20.	SCACL:TP-S composite	.789 (45)	.01	x	x
21.	SCACL:TP-composite, post	.349 (45)	.05		x
37.	CAST:PP-A on stud. tchr.	x	x	.837 (6)	.05

[a] r = correlation coefficient
Sig. = level of significance
( ) = number in sample

TABLE 33

SIGNIFICANT CORRELATIONS OF STUDENT TEACHING QUARTER PROJECT AND NON-PROJECT PRESERVICE TEACHER VARIABLES WITH THE SCACL:TP-URBAN COMPOSITE POSTTEST[a]

Variable Number	Variable Description	Project		Non-project	
		r	Sig.	r	Sig.
6.	Stud. tchr. att. to class	.472 (46)	.01	x	x
13.	CAST:SP-composite by univ. super.	.360 (46)	.05	x	x
14.	CAST:SP-A by univ. super.	.292 (46)	.05	x	x
15.	CAST:SP-B by univ. super.	.403 (46)	.01	x	x
18.	SCACL:TP-U composite, pre	.616 (45)	.01	.579 (45)	.01
20.	SCACL:TP-S composite, pre	.463 (45)	.01	x	x
21.	SCACL:TP-S composite, post	.540 (46)	.01	.427 (45)	.01
29.	Coop. tchr. number classes, prim. assign.	-.309 (44)	.05	x	x
36.	CAST:PP composite on stud. tchr.	x	x	.909 (6)	.05
37.	CAST:PP-A on stud. tchr.	x	x	.944 (6)	.01
38.	CAST:PP-B on stud. tchr.	x	x	.933 (6)	.01

[a]r = correlation coefficient
Sig. = level of significance
( ) = number in sample

TABLE 34

REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SCACL:TP-URBAN COMPOSITE PRETEST[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	20	0.9978	0.9957	0.9957
2	19	0.9984	0.9969	0.0012
3	21	0.9987	0.9975	0.0006

[a]N = 30. Variables 6, 13, 14, 18, 19, 20, and 21 were entered into the regression program. Appendix D, p.213 provides a listing of the variables by number and name.

TABLE 35

STEPWISE ELIMINATION REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SCACL:TP-URBAN COMPOSITE PRETEST[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	19	0.9958	0.9917	0.9917
2	21	0.9966	0.9932	0.0015
3	14	0.9968	0.9935	0.0003

[a]N = 30. Variable number 20 was removed in this stepwise elimination. Variables 6, 13, 14, 18, 19, and 21 were entered into the regression program. Appendix D, p. 213 provides a listing of the variables by number and name.

TABLE 36

REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SCACL:TP-URBAN COMPOSITE POSTTEST[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	18	0.9958	0.9917	0.9917
2	6	0.9976	0.9951	0.0034
3	20	0.9978	0.9956	0.0005

[a]N = 30. Variables 6, 13, 14, 15, 18, 19, 20, and 21 were entered into the regression program.
Appendix D, p. 213 provides a listing of the variables by number and name.

TABLE 37

STEPWISE ELIMINATION REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SCACL:TP-URBAN COMPOSITE POSTTEST[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	6	0.9946	0.9892	0.9892
2	21	0.9965	0.9929	0.0037
3	15	0.9966	0.9931	0.0002

[a]N = 30. Variable number 18 was removed in this stepwise elimination. Variables 6, 13, 14, 15, 19, 20, and 21 were entered into the regression program.
Appendix D, p. 213 provides a listing of the variables by number and name.

cooperating teacher variables (variables 26 to 35) and the composite pretest score on the SCACL:TP-U for the project group. The SCACL:TP-U composite posttest correlated negatively with the number of classes the cooperating teacher had in his primary assignment (variable 29) (Table 33, p. 118). The larger the number of classes a cooperating teacher had the more restricted were the student teachers' views of the types of activities to use for science instruction in an urban setting at the end of his student teaching experience.

No interrelationships are reported for the non-project group as no significant pre- to posttest changes occurred.

Hypothesis 3.

There are no significant relationships between selected classroom student variables and the student teachers' views of the types of classroom activities which should be used for science instruction in an urban setting.

There were no significant correlations for either the project or the non-project groups between the SCACL:TP-U composite pre- and posttests and classroom student variables.

Pilot Measures

The CAST:PP on the non-project student teachers correlated with the pre- and posttest scores on the SCACL:TP-U. Subscale A (variable 37) correlated with both pre- and post-

test scores. The composite score (variable 36) and subscale B (variable 38) correlated with the posttest score only. Non-project student teachers who had more extensive views of the types of classroom activities to use for science instruction in an urban setting were rated higher on the CAST:PP by the secondary students with whom they worked during student teaching (Table 32, p. 117 and Table 33, p. 118).

Summary of Hypotheses 1 - 3

Variables which showed a significant positive relationship with the project student teachers' posttest SCACL:TP-U composite score were: (1) the student teachers' attitudes toward their classes of secondary students, (2) the composite, subscale A, and subscale B scores on the CAST:SP completed by the university supervisors, (3) the composite score on the SCACL:TP-U pretest, and (4) the composite scores on the SCACL:TP-S pre- and posttests.

The variable which showed a significant negative relationship with the project student teachers' posttest SCACL:TP-U composite scores was the number of classes the cooperating teachers had in their primary assignments.

No interrelationships are reported for the non-project group for hypotheses 1 - 3. Pilot measures that correlated with the SCACL:TP-U composite posttest on non-project preservice teachers were the composite and subscales A and B

scores on the CAST:PP.

The best combination of predictors of project student teachers' SCACL:TP-U composite posttest scores are the SCACL:TP-U composite pretest score and the student teachers' attitudes toward their classes (Table 36, p. 120 and Table 37, p. 120).

Hypotheses 4 - 6

Hypothesis 4.

There are no significant relationships between selected student teacher variables and the student teachers' views of the types of activities which should be used for science instruction in a suburban setting.

All correlations reported are for the project group. No interrelationships are reported for the non-project group as there was no significant pre to post change.

The pre- and posttest composite scores on the SCACL:TP-U (variables 18,19) correlated with both the pre- and posttest scores on the SCACL:TP-S composite. Other correlates with the SCACL:TP-S composite pretest were the composite and subscale A scores on the CAST:SP completed by the university supervisors (variables 13,14) and the SCACL:TP-S composite posttest score (variable 21). The SCACL:TP-S pretest (variable 20) correlated with the posttest score on the same measure.

There was a negative correlation between the SCACL:TP-S

composite posttest score and the amount of time the student teachers devoted to laboratory work per week (variable 8). The more comprehensive the student teachers' views of the types of activities which should be used for science instruction in a suburban setting, the fewer minutes per week were used for laboratory instruction. Significant correlations for the SCACL:TP-S pretest scores are shown in Table 38, p. 125 , and significant correlations for the posttest scores are shown in Table 39, p. 126 .

The SCACL:TP-U composite pretest was the best predictor of the score on the SCACL:TP-S composite pretest (Table 40, p. 127). This factor accounted for 99 per cent of the variance. When the SCACL:TP-U composite pretest score was eliminated from the regression program, the SCACL:TP-S composite posttest was the best predictor of the SCACL:TP-S composite pretest. This factor accounted for 99 per cent of the variance (Table 41, p. 127).

The best predictor of the posttest score on the SCACL:TP-S was the SCACL:TP-S composite pretest (Table 42, p. 128). This factor accounted for 99 per cent of the variance. When the SCACL:TP-S composite pretest score was eliminated from the regression program, the SCACL:TP-U composite pretest was the best predictor of the SCACL:TP-S composite posttest. This factor accounted for 99 per cent of the variance (Table 43, p. 128).

TABLE 39

SIGNIFICANT CORRELATIONS OF STUDENT ENDING IN QUARTER PROJECT AND NON-PROJECT TREATMENT TEACHER VARIABLES WITH THE SCACL:PP-CUMULATIVE COMPOSITE PRETEST[a]

Variable Number	Variable Description	Project r	Project Sig.	Non-project r	Non-project Sig.
13.	CAST:SP-composite by univ. super.	.296 (45)	.05	x	x
14.	CAST:SP-A by univ. super.	.353 (45)	.05	x	x
18.	SCACL:TP-U composite, pre	.789 (45)	.01	x	x
19.	SCACL:TP-U composite, post	.463 (45)	.01	x	x
21.	SCACL:TP-S composite, post	.485 (45)	.01	x	x
29.	Coop. tchr. number class primary assign.	-.329 (43)	.05	x	x
36.	CAST:PP-composite on stud. tchr.	x	x	.821 (6)	.05
37.	CAST:PP-A on stud. tchr.	x	x	.823 (6)	.05

[a] r = correlation coefficient
Sig. = level of significance
( ) = number in sample

TABLE 39

SIGNIFICANT CORRELATIONS OF STUDENT TEACHING QUARTER PROJECT AND NON-PROJECT PRESERVICE TEACHER VARIABLES WITH THE SCACL:TP-SUBURBAN COMPOSITE POSTTEST[a]

Variable Number	Variable Description	Project		Non-project	
		r	Sig.	r	Sig.
8.	Stud. tchr. min. lab. per week	-.470 (44)	.01	x	x
18.	SCACL:TP-U composite, pre	.349 (45)	.05	x	x
19.	SCACL:TP-U composite, post	.540 (46)	.01	.427 (45)	.01
20.	SCACL:TP-S composite, pre	.485 (45)	.01	x	x

[a]r = correlation coefficient
Sig. = level of significance
( ) = number in sample

TABLE 40

REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SCACL:TP-SUBURBAN COMPOSITE PRETEST[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	18	0.9978	0.9957	0.9957
2	21	0.9990	0.9979	0.0022
3	14	0.9991	0.9983	0.0004

[a]N = 30. Variables 13, 14, 18, 19, 20, and 21 were entered into the regression program.
Appendix D, p. 213 provides a listing of the variables by number and name.

TABLE 41

STEPWISE ELIMINATION REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SCACL:TP-SUBURBAN COMPOSITE PRETEST[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	21	0.9972	0.9945	0.9945
2	14	0.9980	0.9961	0.0016
3	19	0.9981	0.9962	0.0001

[a]N = 30. Variable number 18 was removed in this stepwise elimination. Variables 13, 14, 19, 20, and 21 were entered into the regression program.
Appendix D, p. 213 provides a listing of the variables by number and name.

TABLE 42

REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SCACL:TP-SUBURBAN COMPOSITE POSTTEST[a]

Step Number	Variable Entered	Multiple R	Multiple RSQ	Increase in RSQ
1	20	0.9972	0.9945	0.9945
2	19	0.9976	0.9951	0.0006
3	18	0.9980	0.9960	0.0009

[a]N = 30. Variables 8, 18, 19, 20, and 21 were entered into the regression program.
Appendix D, p. 213 provides a listing of the variables by number and name.

TABLE 43

STEPWISE ELIMINATION REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SCACL:TP-SUBURBAN COMPOSITE POSTTEST[a]

Step Number	Variable Entered	Multiple R	Multiple RSQ	Increase in RSQ
1	18	0.9943	0.9887	0.9887
2	19	0.9953	0.9907	0.0020
3	8	0.9956	0.9912	0.0005

[a]N = 30. Variable number 20 was removed in this stepwise elimination. Variables 8, 18, 19, and 21 were entered into the regression program.
Appendix D, p. 213 provides a listing of the variables by number and name.

Hypothesis 5.

There are no significant relationships between selected cooperating teacher variables and the student teachers' views of the types of activities which should be used for science instruction in a suburban setting.

No interrelationships are reported for the non-project group.

The only correlation relative to this hypothesis was a negative one between the project student teachers' pretest views of the types of activities which should be used for science instruction in a suburban setting and the number of classes the cooperating teachers had in their primary assignments (variable 29). The more classes the cooperating teachers had in their primary assignments the more restricted were the student teachers' pretest views of the types of activities to be used in a suburban setting (Table 38, p. 125).

Hypothesis 6.

There are no significant relationships between selected classroom student variables and the student teachers' views of the types of classroom activities which should be used for science instruction in a suburban setting.

There were no significant correlations for either the project or the non-project groups between the SCACL:TP-S composite pre- and posttests and classroom student variables.

Pilot Measures

The CAST:PP composite and subscale A scores (variables 36, 37) correlated with the composite pretest score on the SCACL:TP-S for non-project preservice teachers. Non-project student teachers who had more extensive views of the types of classroom activities to use for science instruction in a suburban setting were rated higher on the CAST:PP by the secondary students with whom they worked during student teaching (Table 38, p. 125).

Summary of Hypotheses 4 - 6

Variables which showed a significant positive relationship with the project student teachers' posttest SCACL:TP-S composite scores were (1) the pre- and posttest composite scores on the SCACL:TP-U and (2) the SCACL:TP-S composite pretest.

The variable which showed a significant negative relationship with the project student teachers' posttest SCACL:TP-S composite scores was the time per week used for laboratory instruction.

No interrelationships are reported for the non-project group for hypotheses 4 - 6. No pilot measures correlated with the SCACL:TP-S composite posttest.

The best combination of predictors of project student teachers' SCACL:TP-S composite posttest scores included the SCACL:TP-S composite pretest, and the SCACL:TP-U composite

pretest (Table 42, p. 128 and Table 43, p. 128).

Hypotheses 7 - 9

Hypothesis 7.

There are no significant relationships between selected student teacher variables and the student teachers' attitudes toward culturally deprived students.

No interrelationships are reported for either the project or the non-project groups as no significant pre- to posttest changes occurred on the CAI attitude subscale.

Hypothesis 8.

There are no significant relationships between selected cooperating teacher variables and the student teachers' attitudes toward culturally deprived students.

No interrelationships are reported for either the project or the non-project groups as no significant pre- to posttest changes occurred on the CAI attitude subscale.

Hypothesis 9.

There are no significant relationships between selected classroom student variables and the student teachers' attitudes toward culturally deprived students.

No interrelationships are reported for either the project or the non-project groups as no significant pre- to posttest changes occurred on the CAI attitude subscale.

Pilot Measures

No interrelationships are reported for either the project or the non-project groups as no significant pre- to posttest changes occurred on the CAI attitude subscale.

Summary of Hypotheses 7 - 9

No interrelationships are reported for either the project or the non-project groups.

Hypotheses 10 - 12

Hypothesis 10.

There are no significant relationships between selected student teacher variables and the student teachers' knowledge of culturally deprived students.

No interrelationships are reported for either the project or the non-project groups as no significant pre- to posttest changes occurred on the CAI knowledge subscale.

Hypothesis 11.

There are no significant relationships between selected cooperating teacher variables and the student teachers' knowledge of culturally deprived students.

No interrelationships are reported for either the project or the non-project groups as no significant pre- to posttest changes occurred on the CAI knowledge subscale.

Hypothesis 12.

There are no significant relationships between selected

classroom student variables and the student teachers' knowledge of culturally deprived students.

No interrelationships are reported for either the project or the non-project groups as no significant pre- to posttest changes occurred on the CAI knowledge subscal

Pilot Measures

No interrelationships are reported for either the project or the non-project groups as no significant pre- to posttest changes occurred on the CAI knowledge subscale.

Summary of Hypotheses 10 - 12

No interrelationships are reported for either the project or the non-project groups.

Hypotheses 13 - 15

Hypothesis 13.

There are no significant relationships between selected student teacher variables and the types of classroom activities which the student teachers used for science instruction during student teaching.

Three instruments were used to test hypotheses 13 - 15. They were the SCACL:SP, the CAST:SP-B completed by the cooperating teachers, and the CAST:SP-B completed by the university supervisors. Significant differences were found between the project and non-project groups on the SCACL:SP and on the CAST:SP-B by the cooperating teachers. In both cases

the project group had higher mean scores than the non-project group. There was no significant difference between the project and non-project groups on the CAST:SP-B by the university supervisor (Table 55, p. 156). Discussion of hypotheses 13 - 15 is presented for the project group only concerning the interrelationships of selected variables with the SCACL:SP and with the CAST:SP-B by the cooperating teachers.

The subscale B score on the CAST:SP completed by the university supervisors (variable 15) and the knowledge subscale of the CAI posttest (variable 25) correlated positively with the SCACL:SP on project student teachers (Table 44, p. 135).

Correlates with the subscale B score on the CAST:SP completed by the cooperating teachers were the composite, subscale A, and subscale C scores on the same measure (variables 9,10,12), subscale C of the CAST:SP by the university supervisors (variable 16), and the posttest score on the CAI knowledge subscale (variable 25) (Table 45, p. 136). The best predictor of the score on the CAST:SP subscale B by the cooperating teachers was the composite score on the same instrument (Table 46, p. 138). This factor accounted for 99 per cent of the variance. When the CAST:SP composite score completed by the cooperating teacher was removed from the regression program the CAST:SP-C by the cooperating teacher was the best predictor of the CAST:SP-B by the

TABLE 44

SIGNIFICANT CORRELATIONS OF STUDENT TEACHING QUARTER PROJECT AND NON-PROJECT PRESERVICE TEACHER VARIABLES WITH THE SCACL:SP ON THE STUDENT TEACHER[a]

Variable Number	Variable Description	Project		Non-project	
		r	Sig.	r	Sig.
1.	Class attitude to course	.494 (32)	.01	x	x
3.	Direction of reg. teacher influence	.366 (33)	.05	x	x
11.	CAST:SP-B by coop. tchr.	x	x	.412 (29)	.05
14.	CAST:SP-A by univ. super.	x	x	.375 (34)	.05
15.	CAST:SP-B by univ. super.	.328 (37)	.05	x	x
16.	CAST:SP-C by univ. super.	x	x	.422 (36)	.05
25.	CAI-knowledge subscale, post	.326 (37)	.05	x	x
32.	Coop. tchr. attitude to student text	.499 (37)	.01	x	x
33.	Use of curriculum proj. materials	.476 (35)	.01	.392 (31)	.05
35.	SCACL:SP on coop. tchr.	.716 (34)	.01	.469 (35)	.01

[a] r = correlation coefficient
Sig. = level of significance
( ) = number in sample

TABLE 45

SIGNIFICANT CORRELATIONS OF STUDENT TEACHING QUARTER PROJECT AND NON-PROJECT PRESERVICE TEACHER VARIABLES WITH THE SUBSCALE B SCORE ON THE CAST:SP COMPLETED BY THE COOPERATING TEACHER[a]

Variable Number	Variable Description	Project		Non-project	
		r	Sig.	r	Sig.
4.	Attitude of class to text	.393 (29)	.05	x	x
9.	CAST:SP-composite by coop. tchr.	.863 (40)	.05	.838 (36)	.01
10.	CAST:SP-A by coop. tchr.	.396 (40)	.05	.553 (36)	.01
12.	CAST:SP-C by coop. tchr.	.684 (41)	.01	.672 (36)	.01
13.	CAST:SP-composite by univ. super.	x	x	.481 (31)	.01
14.	CAST:SP-A by univ. super.	x	x	.363 (34)	.05
15.	CAST:SP-B by univ. super.	x	x	.424 (31)	.05
16.	CAST:SP-C by univ. super.	.339 (41)	.05	x	x
17.	SCACL:SP on stud. tchr.	x	x	.412 (29)	.05
25.	CAI-knowledge subscale, post	.309 (41)	.05	x	x

TABLE 45 (continued)

Variable Number	Variable Description	Project		Non-project	
		r	Sig.	r	Sig.
32.	Coop. tchr. attitude to student text	.374 (41)	.05	x	x
33.	Use of curriculum project materials	x	x	.445 (34)	.01
34.	Coop. tchr. attitude to lab. facilities	.371 (41)	.05	x	x
39.	CAST:PP-composite on coop. tchr.	.786 (9)	.05	x	x
40.	CAST:PP-A on coop. tchr.	.825 (9)	.01	x	x
41.	CAST:PP-B on coop. tchr.	.709 (9)	.01	x	x

[a]r = correlation coefficient
Sig. = level of significance
( ) = number in sample

TABLE 46

REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SUBSCALE B SCORE ON THE CAST:SP COMPLETED BY THE COOPERATING TEACHER[a]

Step Number	Variable Entered	Multiple R	Multiple RSQ	Increase in RSQ
1	9	0.9972	0.9944	0.9944
2	10	0.9985	0.9970	0.0026
3	12	1.0000	1.0000	0.0030

[a]N = 30. Variables 9, 10, 11, 12, 16, and 25 were entered into the regression program.
Appendix D, p. 213 provides a listing of the variables by number and name.

TABLE 47

STEPWISE ELIMINATION REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SUBSCALE B SCORE ON THE CAST:SP COMPLETED BY THE COOPERATING TEACHER[a]

Step Number	Variable Entered	Multiple R	Multiple RSQ	Increase in RSQ
1	12	0.9938	0.9876	0.9876
2	25	0.9950	0.9900	0.0024
3	10	0.9950	0.9900	0.0000

[a]N = 30. Variable number 9 was removed in this stepwise elimination. Variables 10, 11, 12, 16, and 25 were entered into the regression program.
Appendix D, p. 213 provides a listing of the variables by number and name.

cooperating teacher. This factor accounted for 99 per cent of the variance (Table 47, p. 138).

Hypothesis 14.

There are no significant relationships between selected cooperating teacher variables and the types of classroom activities which the student teachers used for science instruction during student teaching.

Discussion of interrelationships concerning this hypothesis are limited to the project SCACL:SP and the CAST:SP-B by the cooperating teachers. The reader is referred to the discussion of hypothesis 13 in this section for an explanation of this limitation.

The cooperating teachers' attitudes toward the textbook used by their students (variable 32), the use of curriculum project materials (variable 33), and the scores on the SCACL:SP on the cooperating teachers (variable 35) correlated positively with the SCACL:SP on the project student teachers at the .01 level of significance (Table 44, p. 135). The best predictor of scores on the SCACL:SP in terms of project student teachers was the SCACL:SP in terms of the cooperating teachers (Table 48, p. 140). This factor accounted for 99 per cent of the variance. When the SCACL:SP in terms of the cooperating teacher was removed from the regression program the cooperating teachers' attitudes toward their student's textbook was the best predictor of the

TABLE 48

REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT COOPERATING TEACHER VARIABLES WITH THE SCACL:SP ON THE STUDENT TEACHER[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	35	0.9950	0.9899	0.9899
2	32	0.9950	0.9901	0.0002
3	33	0.9951	0.9903	0.0002

[a]N = 30. Variables 17, 32, 33, and 35 were entered into the regression program.
Appendix D, p. 213 provides a listing of the variables by number and name.

TABLE 49

STEPWISE ELIMINATION REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT COOPERATING TEACHER VARIABLES WITH THE SCACL:SP ON THE STUDENT TEACHER[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	32	0.9644	0.9300	0.9300
2	33	0.9650	0.9313	0.0013

[a]N = 30. Variable number 35 was removed in this stepwise elimination. Variables 17, 32, and 33 were entered into the regression program.
Appendix D, p. 213 provides a listing of the variables by number and name.

SCACL:SP in terms of the student teacher. This factor accounted for 93 per cent of the variance (Table 49, p. 140).

Correlates with the CAST:SP-B completed by project cooperating teachers were the cooperating teachers' attitudes toward their student's textbook (variable 32) and their attitudes toward the laboratory facilities (variable 34) (Table 45, p. 136).

Project student teachers who were rated high by their classroom students at the end of the student teaching quarter on the types of activities used for science instruction worked with cooperating teachers who: (1) had high positive attitudes toward the student's textbook and toward the laboratory facilities, (2) used curriculum project materials, and (3) scored high on the SCACL:SP.

Hypothesis 15.

There are no significant relationships between selected classroom student variables and the types of classroom activities which the student teachers used for science instruction during student teaching.

Discussion of interrelationships concerning this hypothesis are limited to the project SCACL:SP and the CAST:SP-B by the cooperating teachers. The reader is referred to the discussion of hypothesis 13 in this section for an explanation of this limitation.

Classroom student variables that correlated with the

project student teachers' scores on the SCACL:SP were the class's attitude toward the science course (variable 1) and the influence of the regular teachers (variable 3) (Table 44, p. 135).

The attitude of the classroom students toward their textbook (variable 4) correlated with the subscale B score on the CAST:SP completed by the cooperating teachers (Table 45, p. 136).

Project student teachers who were rated high by their classroom students at the end of the student teaching quarter on the types of activities used for science instruction worked with students who: (1) had a high positive attitude toward their textbook and toward their science course, and (2) felt that the student teachers had an influence on their liking their science course.

Pilot Measures

The composite, subscale A, and subscale B scores on the CAST:PP (variables 39,40,41) completed by classroom students at the beginning of the student teaching quarter in terms of their regular (cooperating) teachers correlated with the CAST:SP-B completed by the cooperating teachers (Table 45, p. 136). Project cooperating teachers who were rated high by their pupils on the CAST:PP rated their student teachers high on the CAST:SP-B.

Summary of Hypotheses 13 - 15

Variables which showed significant positive relationships with the types of classroom activities which the project student teachers used for science instruction as perceived by their classroom students or by their cooperating teachers were: (1) the classroom students' attitudes toward the course, their attitudes toward the textbook, and their perceptions of the regular teachers' influence; (2) the student teachers' scores on the composite, subscale A, and subscale C of the CAST:SP completed by the cooperating teachers, the subscale B and subscale C scores on the CAST:SP completed by the university supervisors, and the posttest scores on the CAI knowledge subscale; and (3) the cooperating teachers' attitudes toward the student's textbook, their attitudes toward the laboratory facilities, their use of curriculum project materials, and their scores on the SCACL:SP.

No interrelationships are reported for the non-project group for hypotheses 13 - 15. Pilot measures that correlated with the CAST:SP-B completed by the cooperating teacher were the composite, subscale A, and subscale B scores on the CAST:PP on the cooperating teachers.

The best combination of predictors of project student teachers' SCACL:SP scores included the SCACL:SP on the cooperating teachers, the attitude of the cooperating teachers toward the students' textbook, and the use of curriculum

project materials (Table 48, p. 140 and Table 49, p. 140). The best combination of predictors of project student teachers' CAST:SP-B by the cooperating teachers scores included the composite and subscale C scores on the same instrument (Table 46, p. 138 and Table 47, p. 138).

Hypotheses 16 - 18

Hypothesis 16.

There are no significant relationships between selected student teacher variables and the student teachers' classroom student-teacher relationships.

Two instruments were used to test hypotheses 16 - 18. They were the CAST:SP-A completed by the cooperating teachers and the CAST:SP-A completed by the university supervisors. Significant differences were found between the project and non-project groups on both measures. In both cases the project group had higher mean scores than the non-project group (Table 55, p. 156). Discussion of hypotheses 16 - 18 is presented for the project group only concerning the interrelationships of selected variables with the CAST:SP-A completed by the cooperating teachers and by the university supervisors.

Twelve university supervisors rated forty-six project and forty-six non-project student teachers on the subscale A of the CAST:SP. Since the number of student teachers supervised by each supervisor varied, Chi square was

performed (Wert, 1954). The supervisors as a group did not vary significantly from the mean of 20.6 on the CAST:SP-A (Table 50, p. 146).

Positive correlates with the subscale A score on the CAST:SP completed by the cooperating teachers were the composite, subscale B, and subscale C scores (variables 9,11, 12) on the same measure (Table 51, p. 147).

Several student teacher variables correlated with the university supervisors' perceptions of the project student teachers on the CAST:SP-A. These correlates were the student teachers' attitudes toward their classes (variable 6), their attitudes toward the cooperating teachers (variable 7), the composite, subscale B, and subscale C scores on the CAST:SP completed by the university supervisors (variables 13,15,16), the pre- and posttest composite scores on the SCACL:TP-U (variables 18,19), and the SCACL:TP-S composite pretest scores (variable 20) (Table 52, p. 148). The best predictor of the subscale A score on the CAST:SP completed by the university supervisors was the composite score on the same instrument (Table 53, p. 150). This factor accounted for 99 per cent of the variance. When the CAST:SP composite score completed by the university supervisors was removed from the regression program, subscale B of the CAST:SP completed by the university supervisors was the best predictor of the subscale A score on the CAST:SP completed by the university supervisors. This factor accounted for 99 per cent

TABLE 50

CHI SQUARE OF UNIVERSITY SUPERVISORS RATINGS OF PROJECT AND NON-PROJECT STUDENT TEACHERS ON THE SUBSCALE A SCORE ON THE CAST:SP[a]

Supervisor Code	Number Students	Mean (O)	$\frac{(O-E)^2}{E}$
M	23	21.3	0.023
Be	3	20.0	0.017
W	7	21.3	0.023
Se	8	19.1	0.104
Sm	13	17.9	0.719
Br	18	22.7	0.214
St	1	14.0	2.114
L	3	23.0	0.274
Ha	5	21.0	0.008
R	7	18.9	0.140
C	2	21.5	0.039
Ho	2	20.0	0.017

[a]Chi square = $\sum\left[\frac{(O-E)^2}{E}\right]$

where E = 20.6

Chi square = 3.092

50% level = 10.341
10% level = 17.275
5% level = 19.675
1% level = 24.725

Calculation of E:
Mean- Project = 21.19
Mean- Non-
Mean- Non- 41.12
N = 46 each project and non-project.

Mean(E) = $\frac{41.12}{2}$ = 20.6

TABLE 51

SIGNIFICANT CORRELATIONS OF STUDENT TEACHING QUALITY PROJECT AND NON-PROJECT PRESERVICE TEACHER VARIABLES WITH THE SUBSCALE A SCORE ON THE CAST:SP COMPLETED BY THE COOPERATING TEACHER[a]

Variable Number	Variable Description	Project r	Project Sig.	Non-project r	Non-project Sig.
10.	CAST:SP-composite by coop. tchr.	.709 (40)	.01	.833 (36)	.01
11.	CAST:SP-B by coop. tchr.	.396 (40)	.05	.553 (36)	.01
12.	CAST:SP-C by coop. tchr.	.428 (42)	.01	.572 (37)	.01
13.	CAST:SP-composite by univ. super.	x	x	.769 (32)	.01
14.	CAST:SP-A by univ. super.	x	x	.594 (35)	.01
15.	CAST:SP-B by univ. super.	x	x	.669 (32)	.01
16.	CAST:SP-C by univ. super.	x	x	.552 (37)	.01
30.	Coop. tchr. attitude to class	.360 (43)	.01	x	x

[a] r = correlation coefficient
Sig. = level of significance
( ) = number in sample

TABLE 52

SIGNIFICANT CORRELATIONS OF STUDENT TEACHING QUARTER PROJECT AND NON-PROJECT PRESERVICE TEACHER VARIABLES WITH THE SUBSCALE A SCORE ON THE CAST:SP COMPLETED BY THE UNIVERSITY SUPERVISOR[a]

Variable Number	Variable Description	Project r	Project Sig.	Non-project r	Non-project Sig.
6.	Stud. tchr. attitude to class	.605 (46)	.01	x	x
7.	Stud. tchr. attitude to coop. tchr.	.335 (46)	.05	x	x
9.	CAST:SP-composite by coop. tchr.	x	x	.469 (34)	.01
10.	CAST:SP-A by coop. tchr.	x	x	.594 (35)	.01
11.	CAST:SP-B by coop. tchr.	X	X	.363 (34)	.05
13.	CAST:SP-composite by univ. super.	.902 (46)	.01	.909 (38)	.01
15.	CAST:SP-B by univ. super.	.729 (46)	.01	.739 (38)	.01
16.	CAST:SP-C by univ. super.	.678 (46)	.01	.774 (44)	.01
17.	SCACL:SP on stud. tchr.	x	x	.375 (34)	.05
18.	SCACL:TP-U composite, pre	.373 (45)	.05	x	x

TABLE 52 (continued)

Variable Number	Variable Description	Project r	Project Sig.	Non-project r	Non-project Sig.
19.	:TP-U osite, post	.292 (46)	.05	x	x
20.	:TP-S osite, pre	.353 (45)	.05	x	x
23.	-knowledge scale, pre	x	x	-.324 (44)	.05
26.	Coop. teacher sex	x	x	-.343 (39)	.05
29.	tchr. number classes, prim. assign.	-.299 (44)	.05	x	x
31.	Coop. tchr. attitude to teaching science	x	x	.378 (36)	.05

[a]r = correlation coefficient
Sig. = level of significance
( ) = number in sample

TABLE 53

REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SUBSCALE A SCORE ON THE CAST:SP COMPLETED BY THE UNIVERSITY SUPERVISOR[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	13	0.9975	0.9950	0.9950
2	16	0.9977	0.9954	0.0004
3	19	0.9979	0.9958	0.0004

[a]N = 30. Variables 6, 7, 13, 14, 15, 16, 18, 19, and 20 were entered into the regression program. Appendix D, p. 213 provides a listing of the variables by number and name.

TABLE 54

STEPWISE ELIMINATION REGRESSION ANALYSIS OF STUDENT TEACHING QUARTER PROJECT STUDENT TEACHER VARIABLES WITH THE SUBSCALE A SCORE ON THE CAST:SP COMPLETED BY THE UNIVERSITY SUPERVISOR[a]

Step Number	Variable Entered	Multiple R	RSQ	Increase in RSQ
1	15	0.9949	0.9898	0.9898
2	16	0.9959	0.9919	0.0021
3	6	0.9964	0.9929	0.0010

[a]N = 30. Variable number 13 was removed in this stepwise elimination. Variables 6, 7, 14, 15, 16, 18, 19, and 20 were entered into the regression program. Appendix D, p. 213 provides a listing of the variables by number and name.

of the variance (Table 54, p. 150).

Hypothesis 17.

There are no significant relationships between selected cooperating teacher variables and the student teachers' classroom student-teacher relationships.

Discussion of interrelationships concerning this hypothesis are limited to the project group. The reader is referred to the discussion of hypothesis 16 in this section for an explanation of this limitation.

The single significant correlation between selected cooperating teacher variables and the cooperating teachers' perceptions of the student teachers on the CAST:SP-A was a positive correlation of the cooperating teachers' attitudes toward their classes (variable 30) with the CAST:SP-A (Table 51, p. 147).

There was a negative correlation between the number of classes the cooperating teachers had in their primary assignments (variable 29) and the subscale A score on the CAST:SP completed by the university supervisors (Table 52, p. 148).

Hypothesis 18.

There are no significant relationships between selected classroom student variables and the student teachers' classroom student-teacher relationships.

There were no significant correlations between selected

classroom variables and the project and non-project student teachers' scores on the CAST:SP-A.

Pilot Measures

There were no significant correlations between selected classroom variables and the project and non-project student teachers' scores on the pilot measures.

Summary of Hypotheses 16 - 18

Variables which showed significant positive relationships with the project student teachers' student-teacher relationships as perceived by the cooperating teachers or by the university supervisors were: (1) the student teachers' attitudes toward their classes and their attitudes toward the cooperating teachers, the composite and subscales B and C scores on the CAST:SP-A by the cooperating teachers and by the university supervisors, the composite pre- and post-test scores on the SCACL:TP-U, and the composite pretest scores on the SCACL:TP-S; and (2) the cooperating teachers' attitudes toward their classes.

The number of classes the cooperating teachers had in their primary assignments correlated negatively with the CAST:SP-A completed by the cooperating teachers. The best combination of predictors of project student teachers' CAST:SP-A by the university supervisors included the composite and subscale B scores on the same instrument (Table 53, p. 150 and Table 54, p. 150).

Hypotheses 19 - 21

Hypothesis 19.

There are no significant relationships between selected student teacher variables and the student teachers' personal adjustment.

Two instruments were used to test hypotheses 19 - 21. They were the CAST:SP-C completed by the cooperating teachers and the CAST:SP-C completed by the university supervisors. No significant differences were found between the project and non-project groups on either of these measures; therefore, no interrelationships are reported for these hypotheses (Table 55, p. 156).

Hypothesis 20.

There are no significant relationships between selected cooperating teacher variables and the student teachers' personal adjustment.

No significant differences were found between the project and non-project groups on either of the measures used to test the hypothesis; therefore, no interrelationships are reported for this hypothesis (Table 55, p. 156).

Hypothesis 21.

There are no significant relationships between selected classroom student variables and the student teachers' personal adjustment.

No significant differences were found between the

project and non-project groups on either of the measures used to test the hypothesis; therefore, no interrelationships are reported for this hypothesis (Table 55, p. 156).

Pilot Measures

No significant differences were found between the project and non-project groups on either of the measures used to test hypotheses 19 - 21; therefore no interrelationships are reported for pilot measures (Table 55, p. 156).

Summary of Hypotheses 19 - 21

No interrelationships are reported for either the project or the non-project groups.

First Professional Quarter and Student Teaching Quarter

Problem 1. Project vs. Non-project

Problem 1 was to compare the influence, in terms of criterion variables, of two science education programs for preservice science teachers. The following hypotheses were investigated for the project (two quarter experience) and for the non-project (one quarter experience) groups.

Hypothesis 1.

Project and non-project preservice teachers will not hold significantly different views as to the types of science classroom activities which should be used for science instruction in urban classrooms at the completion of the

student teaching quarter.

A P value of less than 0.57 was determined in testing this hypothesis. The SCACL:TP-U composite posttest was the instrument used in analysis of variance (variable 19, Table 55, p.159). This hypothesis was not rejected as the P value was not significant at the .10 level.

Hypothesis 2.

Project and non-project preservice teachers will not hold significantly different views as to the types of science classroom activities which should be used for science instruction in suburban classrooms at the completion of the student teaching quarter.

A P value of less than 0.62 was determined in testing this hypothesis; therefore this hypothesis was not rejected as the P value was not significant at the .10 level. The SCACL:TP-S composite posttest was the instrument used in analysis of variance (variable 21, Table 55, p. 156).

Hypothesis 3.

Project and non-project preservice teachers will not differ significantly in their attitudes toward culturally deprived students at the completion of the student teaching quarter.

A P value of less than 0.84 was determined in testing this hypothesis. The CAI attitude subscale posttest was the instrument used in analysis of variance (variable 24,

TABLE 55

ANALYSIS OF VARIANCE FOR COMPARING PROJECT AND NON-PROJECT PRESERVICE TEACHERS BY CRITERION VARIABLES[a]

Variable Number	F(1,54)	Mean Square	P less than	Project Mean S.D.	Non-project Mean S.D.
10	3.64	25.65	0.06	21.16 2.34	19.80 3.00
11	4.85	63.88	0.03	20.55 3.11	18.40 4.19
12	0.01	0.05	0.94	20.90 2.94	20.96 3.12
14	3.41	27.88	0.07	21.42 3.04	20.00 2.61
15	0.82	7.12	0.37	19.68 2.51	18.96 3.43
16	0.16	0.98	0.69	20.77 2.49	21.04 2.54
17	2.99	50.81	0.09	34.52 4.60	32.60 3.43
19	0.33	14.17	0.57	51.45 6.39	50.44 6.78
21	0.25	4.69	0.62	53.26 4.45	53.84 4.16
24	0.04	3.39	0.84	109.94 8.71	109.44 8.97
25	0.04	1.23	0.84	70.74 5.88	71.04 4.59

[a]Observations per cell project = 31, non-project = 25
Appendix D, p. 213 provides a listing of the variables by number and name.
Multivariate Analysis of Variance (Poor and Rosenblood, 1971)

Table 55, p. 156). This hypothesis was not rejected as the P value was not significant at the .10 level.

Hypothesis 4.

Project and non-project preservice teachers will not differ significantly in their knowledge of culturally deprived students at the completion of the student teaching quarter.

A P value of less than 0.84 was determined in testing this hypothesis; therefore, this hypothesis was not rejected as the P value was not significant at the .10 level. The CAI knowledge subscale posttest was the instrument used in analysis of variance (variable 25, Table 55, p. 156).

Hypothesis 5.

Project and non-project preservice teachers will not differ significantly in terms of the types of science classroom activities which they used for their instruction during the student teaching quarter.

A P value of less than 0.03 was determined in testing this hypothesis with the CAST:SP-B completed by the cooperating teachers. This P value was significant at the .05 level (variable 11, Table 55, p. 156). A P value of less than 0.37 was determined in testing this hypothesis with the CAST:SP-B completed by the university supervisors. This P value was not significant at the .10 level (variable 15, Table 55, p. 156). A P value of less than 0.09 was

determined in testing this hypothesis with the SCACL:SP. This P value was significant at the .10 level (variable 17, Table 55, p. 156). This hypothesis was rejected based on significant differences for two of the three instruments administered. Mean scores were higher for the project students than for the non-project students on all three measures.

Hypothesis 6.

Project and non-project preservice teachers will not differ significantly in student-teacher relationships.

P values of less than 0.06 and 0.07 were determined in testing this hypothesis with the CAST:SP-B completed by the cooperating teachers and by the university supervisors respectively. Both P values were significant at the .10 level; therefore, this hypothesis was rejected (variables 10 and 14, Table 55, p. 156). Mean scores were higher for the project students than for the non-project students on both measures.

Hypothesis 7.

Project and non-project preservice teachers will not differ significantly in personal adjustment.

P values of less than 0.94 and 0.69 were determined in testing this hypothesis with the CAST:SP-C completed by the cooperating teachers and by the university supervisors respectively. Neither of the P values were significant at

the .10 level (variables 12 and 16, Table 55, p. 156). This hypothesis was not rejected.

Summary of Project vs. Non-project

Project and non-project preservice teachers differed significantly in terms of the types of science classroom activities which they used for their instruction and in terms of their student-teacher relationships during the student teaching quarter. The project group had higher mean scores than the non-project group. The two program groups did not differ significantly in their views of the types of science classroom activities which should be used for science instruction in urban or suburban classrooms, in their attitudes toward or in their knowledge of culturally deprived students, or in their personal adjustment at the completion of the student teaching quarter.

Summary of Analysis

Variables which showed significant interrelationships with the criterion variables are reported and summarized in each of the three major sections of this chapter. Due to the large number of these interrelationships, they are not further summarized in this section.

Several significant within group and between group differences are recorded for the project and non-project groups.

Project

Preservice project S_1 teachers changed their views significantly (increase in pretest to posttest) about the types of science classroom activities which should be used for urban or suburban classroom science instruction at the completion of the first professional quarter. This group retained their gains on these two measures as assessed at the completion of the S_2 student teaching quarter. The project group did not change significantly in their attitudes toward or in their knowledge of culturally deprived students in either of the two quarters of their program.

Non-project

The non-project groups did not change significantly in their views of the types of science classroom activities which should be used for science instruction in urban or suburban classrooms or in their attitudes toward or in their knowledge of culturally deprived students.

Project vs. Non-project

Project and non-project preservice teachers differed significantly in terms of the types of science classroom activities which they used for their instruction and in terms of their student-teacher relationships during the student teaching quarter. The project group had higher mean scores than the non-project group.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The problems in this study were (1) to compare the influence, in terms of criterion variables, of two science education programs for preservice science teachers at The Ohio State University and (2) to investigate the interrelationships of selected preservice teacher, cooperating teacher, classroom student, and pilot variables with the criterion variables. The criterion variables were the preservice teachers' views of the types of classroom activities which should be used for science instruction in an urban or suburban setting, the types of activities the preservice teachers used for science instruction during student teaching, the preservice teachers' attitudes toward and knowledge of culturally deprived children, and the student teachers' personal adjustment and student-teacher relations.

The preservice teacher population was comprised of students in secondary (7 - 12) science education at The Ohio State University. Both project and non-project preservice teachers were involved during Autumn Quarter 1970,

Winter Quarter 1971, and Spring Quarter 1971. Project students were enrolled in their first professional quarter (S_1) preceding student teaching or in their student teaching quarter (S_2). Non-project preservice teachers were enrolled in student teaching.

The instruments used were the Science Classroom Activity Checklist: Teacher's Perceptions (SCACL:TP), in both urban and suburban contexts, the Science Classroom Activity Checklist: Student's Perceptions (SCACL:SP), the Cultural Attitude Inventory (CAI), the Checklist for Assessment of Science Teachers: Supervisor's Perceptions (CAST:SP), and the Checklist for Assessment of Science Teachers: Pupil's Perceptions (CAST:PP). Descriptive and attitudinal information were collected using personnel records and questionnaires.

The SCACL:TP-U, the SCACL:TP-S, and the CAI were administered to first professional quarter project preservice teachers during the first and last weeks of the S_1 quarter. S_1 posttest scores were used as S_2 pretests for the project student teachers.

Pretest and posttest data were collected from both project (S_2) and non-project student teachers. Cooperating teachers and university supervisors completed measures near the end of the student teaching quarter. Classroom students provided input in terms of their cooperating teachers near the beginning of the student teaching quarter and in terms

of their student teachers near the end of the student teaching quarter.

The preservice teachers were not randomly selected for the study, and they were not randomly assigned to either of the two teacher education programs. The student teachers were not randomly assigned to schools or to cooperating teachers within schools. This study assessed outcomes of these programs as they existed.

Data collected on ninety-two student teachers were gathered from 4,194 classroom students in 184 classes in 45 schools. The schools were located in urban (inner city) settings, in intermediate settings, and in suburban (outer city) settings.

Hypotheses involving the analysis of pretest-posttest within group differences were tested using the t-test for testing differences in means. Hypotheses involving the analysis of posttest differences between the project and non-project groups were tested using multi-variate analysis of variance. Chi square was computed for the university supervisors' ratings of student teachers' subscale A scores on the CAST:SP. Correlations and step-wise regression analysis were performed to further define interrelationships for those variables where within group or between group (project or non-project) differences existed.

Conclusions

The conclusions drawn in this section are based on the samples of the population used in this study. Comparisons are made with data obtained by Sagness (1970) in a 1969-70 science education study and by Graening (1971) in a 1970-71 mathematics education study at The Ohio State University. The reader is referred to Chapter IV for discussion of significant findings that are not discussed in this section.

First Professional Quarter

Urban classroom activities

The project S_1 preservice teachers changed their views significantly about the types of science classroom activities which should be used for urban classroom science instruction (Table 20, p. 94). This same finding was made by Sagness (1970). The net gain in mean composite scores by the 1969-70 S_1 students was greater (42.65 to 50.80) than for the 1970-71 group (44.98 to 50.31). The increase in scores from pre- to posttest suggests that experiences in the public schools and opportunities to participate in on-campus laboratory activities may contribute positively to a less restrictive view of activities that should be used in urban situations.

Correlates with the Science Classroom Activity Checklist: Teacher's Perceptions (SCACL:TP) Urban composite pretest in both this study (Table 21, p. 97) and in the

Sagness study involved either subscales of the same instrument or scores on the related suburban measure. Non-SCACL variables did not correlate with pretest scores.

Correlates with the SCACL:TP-Urban composite posttest involved SCACL scores in this study (Table 22, p. 98). The pretest attitude subscale score on the Cultural Attitude Inventory (CAI) and the S_1 preservice teachers' age correlated with the SCACL:TP-U composite posttest in the Sagness study. Since the pattern that emerged based on the two studies involved predominantly SCACL scores, correlations relative to the SCACL:TP-U composite posttest are not useful as potential predictors.

Based on the findings of this study (Table 23, p. 100 and Table 24, p. 100) and those of Sagness, the best combination of predictors of the SCACL:TP-U composite posttest score are the SCACL:TP-S composite posttest score, the SCACL:TP-S composite pretest score and the CAI attitude subscale pretest score. S_1 students appear to view the types of science classroom activities to be used in urban situations to be more similar to those to be used in suburban situations after the S_1 quarter experiences.

Suburban classroom activities

The 1970-71 project S_1 preservice teachers changed their views significantly about the types of science classroom activities which should be used for suburban classroom science

instruction (Table 20, p. 94). Sagness found no significant pre- to posttest change for this variable. The net gain in mean composite scores by the 1969-70 S_1 students was greater (51.25 to 54.20) than for the 1970-71 group (50.50 to 52.38). The increase in scores from pre- to posttest suggests that in-school and campus based experiences contributed to more positive views of activities that should be used in suburban classrooms. Apparently adjustments in instruction based on the Sagness findings were successful in effecting change. The on-campus laboratory activities may have been most influential in effecting this desirable change.

The American College Test (ACT) composite percentile scores correlated positively with the SCACL:TP-S composite pretest score in both this study (Table 25, p. 101) and in the Sagness study. S_1 students with high ACT composite percentile scores had less restrictive pretest views of the types of science classroom activities to be used in suburban situations.

No non-SCACL variables for project preservice teachers correlated with the SCACL:TP-S composite posttest scores in either this or in the Sagness study.

Based on the findings of this study (Table 27, p. 104 and Table 28, p. 104) and those of Sagness, the best predictors of the SCACL:TP-S composite posttest scores are the SCACL:TP-U composite posttest scores and the SCACL:TP-S

composite pretest scores. The best predictors of suburban SCACL composite posttest scores are urban composite posttest scores and vice versa.

Attitudes toward culturally deprived students

The project S_1 preservice teachers did not change significantly in their attitudes toward culturally deprived students in either this study or in the 1969-70 Sagness study. The net gain in CAI attitude subscale mean scores by the 1969-70 S_1 students was slightly greater (109.80 to 111.35) than for the 1970-71 group (108.06 to 110.15). Graening (1971) reported similar results of no significant change in mathematics education. The lack of significant positive or negative changes suggests that either the CAI is not sensitive to changes in attitudes or more probably that sufficient change in attitudes toward culturally deprived students does not occur in the time span of ten weeks.

Knowledge of culturally deprived students

The project S_1 preservice teachers did not change significantly in their knowledge of culturally deprived students in either of the two years of this and the Sagness study. The 1969-70 S_1 students increased in mean scores on the CAI knowledge subscale (72.00 to 74.70). The 1970-71 S_1 students decreased non-significantly in mean scores (70.33 to 69.81). Graening (1971) reported no significant change in CAI knowledge subscale scores in mathematics

education. The lack of significant positive or negative changes suggests that the CAI is not sensitive to changes in knowledge or that changes in knowledge did not occur in the ten week span.

Student Teaching Quarter

Urban classroom activities

Project and non-project preservice teachers did not hold significantly different views as to the types of science classroom activities which should be used in urban settings at the completion of the student teaching quarter (Table 55, p. 156). The project group had a higher mean score than the non-project group. In the 1969-70 study the non-project student teachers held significantly less restrictive views than the project student teachers. Although the 1970-71 results were not significant, the results of 1969-70 were reversed. Additional experiences in urban situations by preservice teachers may be necessary in order for them to hold less restrictive views.

The non-project student teachers in both this study (Table 31, p. 111) and those in the Sagness study did not change their views significantly about the types of science classroom activities that should be used for urban classroom science instruction during student teaching. Both groups had increases in pre- to posttest student teaching quarter scores (1969-70: 49.04 to 50.40, 1970-71: 50.41

to 51.69). Apparently the experiences of student teaching, without prior sensitization to urban settings, was not effective in changing preservice teachers' perceptions. More student teachers should receive experience in urban situations if a change in perceptions of appropriate activities to be used is a desirable educational goal.

The project group decreased significantly in mean scores on the SCACL:TP-U in 1969-70 (49.31 to 47.03). There was a non-significant increase in pre- to posttest S_2 mean scores in 1970-71 (50.31 to 51.72). The 1969-70 decrease in mean scores and the non-significant increase in 1970-71 mean scores (Table 29, p. 107) are contradictory results. No significant positive gains relative to views about the types of activities that may be used in urban settings are indicated by pre- to posttest S_2 scores. Project student teachers may not have made significant gains in their views as a result of their general lack of urban experience. Only five of the twenty-eight public schools used in 1970-71 for S_2 student teachers were categorized as urban (Table 4, p. 60).

If project SCACL:TP-U scores are examined over the two quarter experience, a significant positive change occurred in 1970-71 (Table 30, p. 108). The pre S_1 to post S_2 scores increased from 44.98 to 51.72. The 1969-70 pre S_1 to post S_2 scores increased from 42.65 to 47.03. There was a two quarter gain even if a significant loss occurred in

the S_2 quarter in 1969-70. The two quarter sequence of instruction does positively influence preservice teachers' views of the types of activities that should be used in urban settings when the assessment is conducted over the span of two quarters (approximately twenty weeks). This change, over the two quarter time period, suggests that the sum of the experiences of the senior project (S_1 and S_2) contributed to preservice teachers' alterations in their views of the types of activities to use in urban settings. Influences of any single course in the sequence are masked by the over-all program effects.

The SCACL:TP-U pretest composite score and the SCACL:TP-S composite pre- and posttest scores correlated positively with the SCACL:TP-U composite posttest in both years of this study (Table 33, p. 118) and the Sagness study. The SCACL:TP-U and SCACL:TP-S composite pretests were the best predictors of scores on the SCACL:TP-U composite posttest scores along with the attitudes of the student teachers' toward their classes (Table 36, p. 120 and Table 37, p. 120).

University supervisors' ratings of S_2 preservice teachers on the composite and subscales A and B scores of the Checklist for Assessment of Science Teachers: Supervisor's Perceptions (CAST:SP) correlated positively with the SCACL:TP-U composite posttest scores. The same three components of the CAST: Pupil's Perceptions form, used on a

pilot basis, were also positive correlates (Table 33, p. 114). The university supervisors' and classroom students' assessments are good indicators of the preservice teachers' self perceptions of the types of activities that should be used in urban settings.

Negative correlations with the SCALE:TP-U composite posttest scores were the use of an assigned textbook (Sagness, 1970) and the number of classes the cooperating teachers had in their primary assignments (Table 33, p. 118). It appears that preservice teachers had less restrictive views of urban classroom activities in public school classes where no assigned textbook was used and the cooperating teachers did not have all their classes in the same subject area.

Suburban classroom activities

Project and non-project preservice teachers did not hold significantly different views as to the types of science classroom activities which should be used in suburban settings at the completion of the student teaching quarter (Table 55, p. 156). This result held for both 1969-70 and for 1970-71. Since the largest number of student teaching assignments for both project and non-project were in suburban classrooms (Table 4, p. 60) and the probability that these classrooms reflected values similar to those of the university setting, no significant differences between

project and non-project groups occurred.

The non-project student teachers in both this study (Table 31, p. 111) and those in the Sagness study did not change their views significantly about the types of science classroom activities that should be used for suburban classroom science instruction. Both groups had increases in pre- to posttest student teaching quarter mean scores (1969-70: 52.56 to 53.11, 1970-71: 53.93 to 54.89). As with the preservice teachers' perceptions of urban classroom activities, the single quarter of direct in-school involvement was not sufficient to effect significant positive change in perceptions of what should occur in suburban situations.

Neither the 1969-70 nor the 1970-71 (Table 29, p. 107) project groups changed significantly in mean scores on the SCACL:TP-S during the student teaching quarter. The 1970-71 pre S_1 to post S_2 mean scores increased significantly from 50.50 to 53.09. The 1969-70 pre S_1 to post S_2 mean scores increased from 51.25 to 52.52. For both years, gains in mean scores occurred over the two quarter time span. It appears that more than a single quarter of experience is necessary to effect change in preservice teachers' views of the types of activities that should be used in suburban settings.

It may be that a ceiling mean score on the SCACL:TP has been attained. A composite score of fifty-three for the suburban activities and a composite score of fifty for the

urban activities, out of a possible score of sixty, appear to be the maximum scores attained over the 1969-71 time period. Perhaps group mean scores will not exceed these values. Significant differences may not appear between groups, but it may be possible to raise more restrictive views of pre-service teachers by providing these teachers with campus based and in-school experiences directly oriented to the use of activities in appropriate environmental settings.

The SCACL:TP-S composite pre- and posttest scores correlated positively in both years of the study (Table 39, p. 126). The amount of time spent in laboratory activities per week correlated positively in 1969-70 and negatively in 1970-71 with the SCACL:TP-S posttest score. This contradictory result cannot be explained based on available data.

The best predictor of composite posttest scores on the SCACL:TP-S is the pretest score on the same measure (Table 42, p. 128). This score was also the best predictor in 1969-70. Other predictors are the SCACL:TP-U composite pretest and posttest scores and the amount of laboratory work per week.

Attitudes toward culturally deprived students

Project and non-project student teachers did not differ significantly in their attitudes toward culturally deprived students at the completion of the student teaching quarter (Table 55, p. 156) in 1970-71. A significant difference

was determined in 1969-70. Project participants had greater changes in their attitudes than did non-project participants. The general direction of the change was toward lower attitudes. Graening (1971) reported higher student teaching quarter posttest scores for the project group than for the non-project group, the mean scores being 105.0 and 103.0 respectively. The general trend of no significant between group differences indicated that either the attitude subscale of the CAI is not detecting differences or that the senior project does not effect changes in attitudes toward culturally deprived students.

Sagness determined that non-project student teachers changed significantly in their attitudes toward culturally deprived students (108.22 to 108.42) in 1969-70. The t-test for correlated variance was used to compare pre- and posttest scores. Graening (1971) reported a significant decrease in scores from pre- to posttest for 1970-71 non-project mathematics student teachers. There was a non-significant decrease in scores (108.43 to 108.15) for 1970-71 non-project science student teachers.

The pattern of results for project student teachers was no significant change in either year of the project. Even though the differences were non-significant, there were net decreases in scores (1969-70: 110.27 to 106.21, 1970-71: 110.15 to 109.30). Graening reported a significant decrease in scores from pre- to posttest for 1970-71 mathe-

matics project student teachers. Pre S_1 to post S_2 differences were not significant in 1970-71 (109.01 to 109.30) for science preservice teachers. Mathematics project preservice teachers had a non-significant decrease in pre S_1 to post S_2 scores relative to attitudes toward culturally deprived students.

The general pattern of no significant differences suggests that the period of ten to twenty weeks is not sufficient to effect change in attitudes regardless of the instructional program. The decreases in scores during the student teaching quarter suggests that either preservice teachers actually held more restrictive or negative attitudes after intense experiences in the public schools or since student teaching was most often the culminating experience of undergraduate education, results on the posttest were not reliable. The first alternative may be more plausible than the second alternative as this pattern of pre- to posttest loss held only for CAI subscales and not for the SCACL:TP scores. A change in instrument may be warranted in order to assess accurately preservice teachers' changes in attitudes toward culturally deprived students.

Knowledge of culturally deprived students

Project and non-project student teachers did not differ significantly in their knowledge of culturally deprived students at the completion of student teaching (Table 55,

p. 156) in 1970-71 or in 1969-70 as reported by Sagness (1970). Graening (1971) reported higher student teaching quarter posttest scores for the project group than for the non-project group, the mean scores being 70.9 and 69.5 respectively. The combined results of the three studies imply that the senior project, as a single instructional unit in science and mathematics education, does not significantly affect preservice teachers' knowledge of culturally deprived students as assessed at the end of the instructional sequence.

Non-project student teachers did not change significantly in their knowledge of culturally deprived students in the three studies done in 1969-71 as assessed by pre S_2 and post S_2 CAI knowledge subscale scores.

Project student teachers decreased significantly in their knowledge of culturally deprived students in 1969-70, the pre- and post S_2 scores being 73.03 and 68.47 respectively. Pre S_2 to post S_2 and pre S_1 to post S_2 results for the 1970-71 science and mathematics preservice teachers showed no significant differences. Graening (1971) reported a non-significant decrease from pre S_1 to post S_2 in CAI knowledge subscale scores.

The instructional programs (project or non-project) did not effect changes in preservice teachers' knowledge of culturally deprived students. The results of three studies over a two year period suggest that preservice teachers did

not receive sufficient experiences in the senior program to increase their knowledge of culturally deprived students as assessed by the CAI. The CAI may not be the appropriate instrument to detect within group pre- to posttest and between group differences in knowledge of or in attitudes toward culturally deprived students.

Classroom activities used during student teaching

Sagness reported that project student teachers used significantly fewer activities thought to contribute positively to the attainment of contemporary objectives of science education than did non-project student teachers. The 1970-71 results were the opposite with project mean scores being greater than non-project mean scores, significant at the .10 level (Table 55, p. 156). Apparently adjustments in university instruction and student teacher placement were sufficient to reverse the 1969-70 results.

Three positive correlations were significant in both 1969-70 and 1970-71. The use of course content improvement project materials, the cooperating teachers' scores on the SCACL:SP, and the attitudes of public school students toward their science classes correlated with the SCACL:SP scores on the student teachers. The first two variables in the preceding sentence correlated with both project and non-project groups (Table 44, p. 135). The cooperating teachers' scores on the SCACL:SP were the best predictor of student teachers'

scores on the same instrument in both years of this (Table 48, p. 140 and Table 49, p. 140) and the Sagness study.

Other positive correlations found in 1970-71 that support the hypothesis of the major influence of the cooperating teachers are the cooperating teachers' attitudes toward the textbook used by their students and the influence of the cooperating teachers as assessed by their classroom students. Sagness found a positive correlation between the SCACL:SP scores on the cooperating teacher and their attitudes toward their laboratory facilities. The SCACL:SP scores on the project student teachers correlated positively with the subscale B (activities section) of the CAST:SP completed by the university supervisors.

Sagness found a significant negative correlation between the SCACL:SP scores on the student teachers and the CAI knowledge subscale posttest scores. A positive relationship between the same two variables was determined in 1970-71 (Table 44, p. 135). A positive correlation was found between the knowledge variable and the subscale B scores on the CAST:SP completed by the cooperating teachers (Table 45, p. 136). The two positive correlations in 1970-71 indicate that the factors responsible for the 1969-70 negative correlations have been adjusted.

Project and non-project student teachers differed significantly in the types of science classroom activities used for instruction as assessed by the CAST:SP subscale B com-

pleted by the cooperating teachers. The non-project student teachers used significantly fewer activities thought to implement positively the contemporary objectives of science education (Table 55, p. 156). Positive correlations between selected variables and the CAST:SP-B completed by the cooperating teachers (Table 45, p. 136) are similar to those found for the SCACL:SP.

The preceding data suggest that if the contemporary objectives of science education are to be attained, preservice teachers should have experiences in classrooms where certain conditions exist. The top group of student teachers (scores one standard deviation above the mean) and the bottom group of student teachers (scores one standard deviation below the mean) were categorized by their cooperating teachers' attitudes toward their laboratory facilities (responses are 1 = non-existent...5 = excellent), their cooperating teachers' scores on the SCACL:SP, their cooperating teachers' scores on subscale A (student-teacher relations) of the CAST:PP, and their scores on the CAST:PP-A. The CAST:PP was used Winter and Spring quarters on a pilot basis with fifteen cooperating teachers and fifteen student teachers. The cooperating teachers' use of course content improvement project materials was categorized by the top half and the bottom half rather than by groups one standard deviation above or below the mean as the responses on the questionnaires were either yes = 1 or no = 0.

The results of this analysis (Appendix G, p. 226) indicate that little crossover occurs between the high and low groups. Cooperating teachers who perceived their facilities as being adequate and who used course content improvement project materials were rated high by their classroom students on the SCACL:SP or on the CAST:PP-A. Cooperating teachers who perceived their facilities as being inadequate and who did not use course content improvement project materials were rated low by their classroom students on the SCACL:SP or on the CAST:PP-A. Cooperating teachers are more likely to have positive student-teacher relations and to use an inquiry approach in teaching science if they perceive their facilities as being adequate and they use course content improvement project materials. Preservice teachers should be placed where the following conditions (listed in order of importance) exist: (1) cooperating teachers score high on the SCACL:SP, (2) cooperating teachers feel their laboratory facilities are adequate, (3) course content improvement project materials are used, (4) cooperating teachers have favorable attitudes toward the students' textbook, (5) classroom students like their science course, and (6) classroom students feel their cooperating (regular) teacher is influencing their liking of the course.

The classroom students, the cooperating teachers, and the university supervisors had similar views of the types of activities used by student teachers. This is supported

the numerous positive correlations between the SCACL:SP, CAST:SP by both the cooperating teachers and the university supervisors, and the CAST:PP on the cooperating teachers (Table 44, p. 135 and Table 45, p. 136).

Student-teacher relations

Project student teachers had more positive student-teacher relations than the non-project group as assessed by both cooperating teachers and university supervisors (Table p. 156). Correlations with the CAST:SP-A included the student teachers' attitudes toward their classes, their attitudes toward the cooperating teachers, certain SCACL scores, composite and subscale CAST:SP scores, and the cooperating teachers' attitudes toward their classes (Table 51, p. 147 and Table 52, p. 148).

This subscale of the CAST:SP has detected differences between the project and non-project groups. The greater amount of in-school experience by the project preservice teachers may account for the significant between group differences. Project preservice teachers had more opportunities than non-project student teachers to work with university personnel, public school personnel, and classroom students in various environmental settings.

Teachers' personal adjustment

Project and non-project preservice teachers did not differ significantly in personal adjustment as assessed by

subscale C of the CAST:SP completed by both cooperating teachers and university supervisors (Table 55, p. 156). This subscale does not appear to be effective in detecting between group differences if, in fact, these differences existed.

Recommendations

The conclusions drawn in this report are based on this investigator's 1970-71 study and on the work of Sagness in 1969-70. Data relative to attitudes toward and knowledge of culturally deprived children also are drawn from Graening's study of mathematics education in 1970-71. The following recommendations are based on these findings. Recommendations for program adjustments and recommendations for further research are presented. The research section is divided into suggestions relative to kinds of problems to be researched and the appropriate methodologies that may be applied.

Recommendations for Program Adjustments

1. The practicum or methods course should be taught as an integral facet of the S_1 experience. Activities explored on campus should be tested in both urban and suburban public school classrooms.
2. More emphasis should be given to instruction and personal experiences with culturally deprived students. Specifically, experiences should be provided that

would allow preservice teachers to become more knowledgeable about culturally deprived students. Experiences in addition to the approximately eighty hours during S_1 are needed.

3. Student-teacher relations of a personal nature should be pursued as a component of the instructional sequence. If experience with students is the variable that effects positive student-teacher relations, the five quarter junior and senior project sequence should prepare teachers who have positive personal relations with their students.

4. Preservice teachers should be placed in public school situations where as many as possible of the following conditions exist:

   a. The cooperating teacher is rated high by his students on the SCACL:SP.

   b. The cooperating teacher has a favorable attitude toward the laboratory facilities that are available for his use.

   c. Course content improvement project materials are in use. This should be a selection criterion only if the materials are being used in the manner for which they were designed. If a very rigidly structured situation exists, preservice teachers may not have opportunities to use activities of an inquiry nature. Classrooms with no assigned textbook may

be viable situations in which to place S_1 students who will then have opportunities to develop and use science classroom activities under the guidance of the cooperating teacher and the university instructor.

d. The cooperating teacher has a favorable attitude toward the textbook used by his students.

e. Classroom students indicate that they have favorable attitudes toward the science class in general.

f. The classroom students state that their teacher (cooperating teacher) positively influences their liking of the science class.

g. The cooperating teacher has a full schedule of classes all of which do not require the same basic preparation and teaching strategies.

5. Inservice teachers who scored in the low group (scores one standard deviation below the mean) on the SCACL:SP, who perceived their facilities as being inadequate, and who did not use course content improvement project materials should not be used as cooperating teachers.

6. Certain selection criteria should be established to limit preservice teacher enrollment so as to better utilize the staff and facilities of the public schools and the university. Two selection criteria would be to admit students who have high pretest SCACL:TP scores and those who have high ACT composite percentile scores.

These criteria should be used in combination with other factors.

7. The SCACL:TP could be administered at points throughout the two year program to determine if preservice teachers are changing their perceptions of the types of activities that should be used in urban or suburban environmental settings. The individual scores and group means would provide feedback to the instructional staff concerning the effectiveness of the program as well as providing a measure of individual preservice teacher change.

Recommendations for Further Research

Problems to be researched

1. Since the science teacher preparation program at The Ohio State University has evolved into a five quarter sequence, a study that encompasses the entire sequence should be completed. Evaluation should involve measures at the beginning of the junior year, measures at the end of the junior year, and final measures after the completion of student teaching in the senior year. Variables that should be measured pertain to the preservice teachers' perceptions of the types of activities to be used in urban or suburban situations, the types of activities used by the preservice teacher, preservice teachers' student-teacher relations, and

possibly attitudes toward and knowledge of culturally deprived students.

Other variables that are relevant to the junior year sequence should be evaluated. Examples of these are preservice teachers' effectiveness as tutors of individual students, preservice teachers' effectiveness working in small groups, and preservice teachers' questioning techniques. A study by Erb (1971) may provide some direction for this type of study. Since the "conventional" program is no longer available as a control, the evaluation would be a within group change study as measured by changes from pre- to posttests. The information obtained could guide the faculty in the continuous revision of the program based on data.

2. The effect of laboratory facilities on preservice teachers' perceptions of activities to use and the actual types of activities used should be tested. The problem may encompass two components: the effects of on-campus facilities and the effects of in-school facilities. Does the availability of adequate laboratory facilities make a difference in what a preservice teacher does with public school students?
3. Follow-up studies of college students who have participated in the program should be continued (Brewington, 1971 and Cignetti, 1971). Graduates should be assessed after one, three, and five years in the field as in-

service teachers. Frequency data of how many graduates are teaching at the end of five years, in what types of situations, and other descriptive data are desirable to provide feedback to the university faculty.

4. The Cultural Attitude Inventory (CAI) knowledge subscale should be used with future senior project groups. If the data collected are similar to those in the past, the CAI should be revised, an alternate instrument should be constructed, or instructional priorities and experiences should be adjusted.

5. The Checklist for Assessment of Science Teachers: Pupil's Perceptions (CAST:PP) should be used with larger numbers of pre- and inservice teachers. The use of the CAST:SP (Supervisor's Perceptions) should be continued with future groups. Subscales A and B (student relations and activities sections) appear to be reliable and indicative of what is occurring in a classroom. Subscale C (personal adjustment) should be analyzed further.

A factor analysis should be performed on the instrument. A scoring procedure that puts various responses together may be more accurate in assessing a teacher's competencies in certain areas. For example, a preservice teacher who does not understand adolescents, who is feared by students, and who is usually touchy and suspicious would not be a promising teacher

candidate regardless of the types of classroom activities he used.

Research methodologies

1. The collection of data for each teacher may be limited to a single class. Where comparable data were gathered from two classes in this study, multivariate analysis of variance was performed (Appendix E, p. 216). No significant differences existed between classes on the variables analyzed.
2. Interrelationships (correlations and regressions) may be performed only where between group or within group differences exist as was done in this study. Interrelationships among variables are not useful as indicators or predictors unless between group or within group differences exist.
3. The SCACL:TP-U composite posttest may be used to predict group scores on the SCACL:TP-S composite posttest and vice versa. If time is a problem in data collection, the SCACL:TP in either the urban or the suburban context may be given and used to predict the complementary scores.
4. The CAI attitude subscale score should be eliminated from future studies based on the results of this study and those of Sagness and Graening. The knowledge subscale should be used and carefully analyzed. A change

in language from culturally "deprived" to "different" may make the instrument more congruent with current terminology.

5. Changes in pre- to posttest scores may be more apparent and meaningful if this technique is used over a period of time longer than one quarter. In this study several pre S_1 to post S_2 changes were apparent which were masked if the pre- to posttest assessment was limited to either the S_1 or the S_2 quarters.

6. In order to provide comprehensive feedback, assessments from several sources should be used. A hierarchy of feedback sources from most to least reliable, based on the findings of this study, is: feedback from classroom students, from cooperating teachers, from university supervisors, and from preservice teachers. This hierarchy appears to apply to all areas except where perceptions are measured as with the SCACL:TP in a pre- to posttest situation. For feedback as to what ties a student teacher uses, classroom students are reliable and informative.

7. The SCACL:TP appears to have a ceiling score of fifty-three in a suburban context and fifty in an urban context. Evaluation should be directed toward determining if low scores can be raised by instructional techniques. Over-all group means may increase slightly but by raising low scores, while high scores remain unchanged, the

group variability would decrease. Studies directed toward the analyzing of variability are in order.

APPENDIX A

CHECKLIST FOR ASSESSMENT OF SCIENCE TEACHERS (CAST)

1. CAST: SUPERVISOR'S PERCEPTIONS
2. CAST: PUPIL'S PERCEPTIONS

1. *CHECKLIST FOR ASSESSMENT OF SCIENCE TEACHERS: SUPERVISOR'S PERCEPTIONS

Directions: Circle the letter of the answer which most accurately indicates your honest and objective evaluation of the behavior of the teacher being rated. Circle only one response under each of the fifteen questions. Mark all your responses on the answer sheet. Make no marks on this booklet. You may possibly find that each phrase in a particular response is not applicable to the subject being rated. The closest approximation is what is desired. Read all the responses before making a decision.

1. What is the status of the teacher's disciplinary ability?

   a. The teacher makes the students feel free and natural. They are actively interested in and busy with school work. They are able to govern themselves.

   b. The teacher sees to it that work proceeds with little or no interruption. The students are usually attentive to the task at hand.

   c. The teacher is able to restore "order" with an occasional reprimand or warning look. The room is fairly quiet; there is some whispering and inattention. The teacher is usually sensitive to minor lapses of conduct.

   d. The teacher attempts but is unable to control his class. Students in his classroom appear restless. There is considerable inattention and noisy behavior.

   e. The teacher is an authoritarian who "rules with an iron hand." An atmosphere of nervousness and tenseness persists. The classroom is exceptionally quiet. The students do not respect the teacher.

2. Does the teacher have a "student" or a "subject-matter" point of view?

a. The teacher is interested in the personality development of the student. He is sensitive to individual differences in students' abilities, interests, and needs. The teacher wants to help students with their personal problems as well as with the subject he is teaching. He tries and often does help students with their problems.

b. The teacher is sensitive to the various needs of students but does little to meet them. He concentrates on the students' need to learn the subject he is teaching. He varies his standards of achievement for students with different levels of ability.

c. The teacher is aware of the various needs of the students, but he believes the teacher's responsibility is limited to teaching his subject. The teacher talks about the individual differences of students but does little about such differences.

d. The teacher is insensitive to any of the needs of students. He is interested only in the subject he is teaching. The teacher sometimes requires the students to do meaningless "busy work."

e. The teacher ignores students as individuals. He thinks only of subject-matter mastery. Every student must meet the same requirements of achievement. The teacher requires meaningless "busy work" of the student. The students usually do work from the textbook.

3. What is the nature of the teacher's attitude toward adolescents?

a. The teacher regards the adolescent objectively for what he is. The teacher is friendly and understanding. The teacher likes adolescents and enjoys having them around. He listens to the opinions of adolescents.

b. The teacher understands that adolescents have potentialities for development, and he does what he can to help them develop these potentialities. The teacher expresses the desire to know adolescents better.

c. The teacher often does not try to understand the feelings or opinions of adolescents. He thinks adolescents "just need to grow up." The teacher evaluates adolescents by adult standards rather than by what the adolescents can do.

d. The teacher views the adolescent as a "miniature adult." He tends to expect too much or too little of adolescents.

e. The teacher does not try to understand adolescents. He is not interested in the opinions of adolescents. He is often ill at ease or uncomfortable when adolescents are with him.

4. How does the teacher understand adolescents who have behavior problems?

   a. The teacher is not as concerned about adolescents who misbehave in class as he is about adolescents who are "too quiet." He tries to find reasons why adolescents act as they do, and he tries to help them solve their problems.

   b. The teacher is aware that adolescents have problems. He looks for reasons why adolescents misbehave. The teacher expects students to behave even if they have problems, and he will punish them if necessary.

   c. The teacher usually is not aware that adolescents have reasons for their actions. He knows he should learn something about the background of adolescents, but he often punishes instead.

   d. The teacher is not aware that adolescents have problems. He treats all adolescents who misbehave the same way. He always punishes them.

   e. The teacher thinks adolescents who are disobedient are the most serious problems. He thinks the shy, quiet adolescents are the "perfect students." He does not try to understand the reasons for the actions of adolescents. He punishes all adolescents who misbehave.

5. What is the attitude of students toward this teacher?

   a. Students can talk freely with the teacher. They like him very much.

   b. Students respect and admire the teacher, but they feel uncomfortable when talking to him personally.

   c. Students generally like the teacher and are willing to do what he wants.

   d. Students do not fear the teacher, but they do not respect or like him.

   e. Students fear and stay away from the teacher. They might even harm him if they could.

6. What do the students do in the teacher's class?

a. The students often discuss the problems faced by scientists in the discovery of a scientific principle. They also discuss the kind of evidence that is behind a scientist's conclusions. If the students do not agree with the teacher, he encourages them to say so. The students are frequently given time in class to talk among themselves about ideas in science. They usually do most of the experiments and demonstrations themselves.

b. The students sometimes discuss the problems faced by scientists in the discovery of a scientific principle. They also discuss the evidence that is behind a scientist's conclusions. They sometimes do experiments and demonstrations themselves. They can question what the teacher says.

c. The students infrequently discuss the problems faced by scientists in the discovery of a scientific principle. They spend part of the class time answering the teacher's questions. They also write answers to questions from their textbook or study guides. They do some experiments themselves.

d. The students ask questions to clarify what the teacher or the textbook has told them. They watch the teacher do demonstrations. They write answers to questions from the textbook or study guides. They answer the teacher's questions.

e. The students must copy down and memorize what the teacher tells them. Most of the students' questions are to clear up what the teacher or the textbook has told them. They often write answers to questions from the textbook or study guides.

7. What is the role of the teacher in the classroom?

a. The teacher helps the students understand the general objectives or purposes of a lesson before they begin work on the lesson. He questions the students about ideas that the students have studied previously and about the evidence that is behind statements that are made in the textbook. He often asks the students to explain diagrams and graphs.

b. The teacher often questions the students about ideas that they have studied previously and about the evidence that is behind statements that are made in the textbook. He sometimes asks the students to explain diagrams and graphs.

c. The teacher spends most of the class time telling the students about science. He repeats much of what the textbook says. He sometimes questions the students about ideas that they have studied previously.

d. The teacher sometimes repeats exactly what the textbook says. If there is a disagreement among students during a discussion, the teacher usually tells the students who is right. Most of the time the teacher tells the students about science.

e. The teacher shows the students that science has almost all of the answers to questions about the natural world. If there is a disagreement among students during a discussion, the teacher tells the students who is right. The teacher often repeats exactly what the textbook says.

8. How does the teacher use the textbook and reference materials?

a. The teacher expects the students to find the major ideas in the textbook and the evidence to support the ideas. He shows the students how to question ideas in the textbook. The teacher provides time for the students to read about science in magazines and books other than the textbook.

b. The teacher expects the students to learn some of the details in the textbook. There are books and magazines in the room if the students want to use them. The teacher shows the students how to question ideas in the textbook.

c. The teacher expects the students to learn many of the details in the textbook. The teacher has the students look for some of the major ideas in the textbook and the evidence to support the ideas. He sometimes requires students to outline parts of the textbook. The only science talked about is from the textbook and the teacher's notes.

d. The teacher expects the students to outline part of the textbook. The only science talked about is from the textbook and the teacher's notes. The teacher requires the students to learn most of the details in the textbook.

e. The teacher does not like the students to question information in the textbook. The teacher often has the students write out definitions to words. The teacher requires the students to outline parts of the textbook and to memorize most of the details in the textbook.

9. How are the teacher's tests designed, and how are they used?

a. The teacher's tests have many questions about the laboratory activities. The tests often require the students to figure out answers to new problems. Sometimes the students must find ways of looking for answers to problems. Often they must repeat skills they have learned in the laboratory, such as making observations and interpreting data.

b. The teacher's tests have many questions about the laboratory activities. The tests sometimes require the students to figure out answers to new problems. Sometimes the students must repeat skills they have learned in the laboratory, such as making observations and interpreting data.

c. The teacher's tests sometimes ask the students to label drawings. The tests sometimes have questions about the laboratory activities. Sometimes the tests require the students to tell about ideas that they have learned previously.

d. The teacher's tests often ask the students to write out definitions to words. The tests do not require the use of mathematics to answer the questions. Often the tests require the students to label drawings.

e. The teacher's tests often require the students to write out definitions to words. Often the students must label drawings. The tests do not require the use of mathematics to answer the questions. The teacher does not provide the opportunity to discuss the test questions in class.

10. How does the teacher conduct the laboratory?

a. The teacher and students spend time before an experiment discussing the purposes of the experiment. The teacher often allows the students to try their own ways of doing the laboratory experiment. The students can compare their answers to those of others when they are finished. They are allowed to do experiments on their own.

b. The teacher and students spend time before most experiments discussing the purposes of the experiment. The data one student gathers from an experiment are often different from the data gathered by another student. The teacher allows the students to do some experimenting on their own.

c. The teacher and students sometimes discuss the purposes of an experiment. The students sometimes may compare their answers to those of others when they are finished. The teacher allows less than one third of class time for laboratory experiments.

d. The teacher sometimes conducts the laboratory in such a way that the students know the answers to a question before they do an experiment. The teacher and students seldom discuss the purposes of an experiment. The teacher allows less than one fourth of the class time for laboratory experiments.

e. The teacher does not allow students to do experiments on their own. The teacher conducts the laboratory in such a way that the students know the answers to a question before they do the experiment. The teacher does not discuss the purpose of an experiment. The teacher allows very little class time for laboratory experiments.

11. Is the teacher capable of analytical thinking?

a. The teacher is intellectually mature. He approaches problems analytically, is capable of theorizing, and enjoys solving problems. His work is carefully planned and detailed. He is persistent and serious.

b. The teacher is generally persistent, serious, and able to analyze and solve more pressing problems. He attempts to organize and plan his work, but he is sometimes lacking in details.

c. The teacher is capable of analytical thinking, but at times he accepts the ideas of others uncritically rather than doing independent thinking. He avoids activities that involve careful planning and detailed work unless he is asked to become involved. He uses habitual procedures.

d. The teacher appears to be casual rather than serious. He is likely to attend to duties as the "spirit moves him." He is willing to "go along with the crowd."

e. The teacher accepts uncritically the ideas of others. He may not be able to think critically. He is willing to avoid planning and thinking. He dislikes intellectual or creative activities.

12. What are the social attitudes of the teacher?

a. The teacher is more interested in people than in things. He converses readily and freely, and makes friends easily. He participates in and enjoys social mixing. He frequently assumes leadership positions.

b. The teacher usually appreciates the opportunity to work with people and seems to enjoy social activities. He appears to be at ease in social groups. He attempts to analyze and improve social relationships.

c. The teacher is quite friendly, but reserved. He will participate in social events only to the extent demanded by his position. He will assume leadership only when asked to do so.

d. The teacher does not like to assume leadership in social functions. He tends to be more interested in things than in people. He dislikes affiliating with social groups.

e. The teacher is very self-conscious, shy, and socially timid. He gives evidence of lacking common social skills. He prefers to be alone.

13. What emotional attitudes are shown by the teacher?

a. The teacher's "spirits" are stable and uniform. He is not subject to apprehensive fears or worries and is not easily upset or frustrated. He avoids tension through relaxation. He sees life in reality. He is optimistic.

b. The teacher usually demonstrates good emotional control. He takes things in stride; he settles most minor problems without undue tension or frustration. He appears to be well adjusted and has good physical vigor.

c. The teacher is moody and sometimes emotionally unstable. He frequently appears rushed or disrupted by minor problems. He attempts to be calm in most situations. His poise comes only with considerable effort.

d. The teacher is usually serious and reserved. He is indecisive and uncertain. He often appears distracted as though torn by several demands. He frequently seems embarrassed.

e. The teacher is easily disrupted by minor problems and events. He is readily and easily embarrassed. He often appears tired and listless. His actions appear impulsive and jittery. He frequently feels thwarted and suffers from tension, worry, and uneasiness. He is frustrated and impatient.

14. To what extent does the teacher demonstrate self-confidence?

a. The teacher makes decisions readily. He feels confident of his own judgment and usually makes correct decisions. He easily adjusts to new or difficult situations. He enjoys the approval and favor of his associates. He is optimistic about the present and the future. He is not dissatisfied with his physique or appearance.

b. The teacher is usually equal to varying demands. He does not hesitate to make decisions even though they are not always approved by others. He generally adjusts to new situations without tension.

c. The teacher sometimes feels inferior. He is often pessimistic about the past and the future. He makes decisions but often does not have confidence in his judgments.

d. The teacher avoids new or difficult situations, preferring to follow his habitual routines. He feels sorry for himself much of the time. He makes decisions only after consulting with several friends and associates. He is generally dissatisfied with his personal appearance and ability.

e. The teacher displays the traditional "inferiority feeling." He cannot make decisions satisfactorily or easily. He distrusts his own judgment and ability.

15. To what extent does the teacher develop satisfactory personal relations?

a. The teacher does not lose patience readily and is not angered frequently or easily. He does not feel slighted or misunderstood by others. He is seldom excessively critical of friends and associates.

b. The teacher is conversational and friendly. He has a good sense of humor. He usually has an understanding point of view. He has reasonably good control of his temper.

c. The teacher attempts to work satisfactorily with others when the occasion demands. He is inclined to lose patience when the "chips are down." He tends to be overly critical of friends and associates.

d. The teacher tends to lose patience easily and frequently when working with associates. He displays little effort to work effectively with others.

e. The teacher is easily irritated by others. He is usually touchy and suspicious. He is inconsiderate when working with his associates. He frequently antagonizes others.

2. *CHECKLIST for ASSESSMENT of SCIENCE TEACHERS:

PUPIL'S PERCEPTIONS

by

William R. Brown
and
Betty J. Brown

Directions: Mark the space on the answer sheet which most closely states your honest opinion of the behavior of your teacher or what usually happens in your classroom. Whether your teacher is a man or a woman, your teacher will be referred to as "he" in all of the questions and the responses. Mark only one response under each of the ten questions. Make all your responses on the answer sheet. Make no marks on this booklet. You may possibly find that each phrase in a particular response does not apply to your teacher. Please mark the one that most closely describes your teacher or what usually is happening in your classroom. Read all the responses before you choose one.

A. How does your teacher keep his class in order?

1. Our teacher makes us feel free and natural. We are very interested in and busy with school work. We are able to take care of ourselves.

2. Our teacher sees to it that work goes on with little or no stopping. We usually pay attention to the work at hand.

3. Our teacher [illegible] to bring the class back to order with a few warning looks or words. The room is fairly quiet. Some students are whispering and not paying attention. The teacher is usually aware of minor misbehaviors.

4. Our teacher tries but is unable to control the class. We are restless. We do not pay attention. The classroom is noisy.

5. Our teacher is strict and rules with an iron hand. Most students are tense and nervous. The classroom is very quiet. Students do not respect our teacher.

B. Is your teacher more interested in you or in the subject he is teaching?

1. Our teacher is interested in us as people. He is aware that we can do, are interested in, and need different things. Our teacher wants to help us with our personal problems as well as with the subject he is teaching. He tries and often does help us with our problems.

2. Our teacher is aware of our different needs but does little to help us with them. He pays attention to our need to learn the subject he is teaching. He expects less of the lower ability students than of the higher ability students.

3. Our teacher is aware of our different needs but thinks the teacher should teach only his subject. Our teacher talks about our individual differences but does little about the differences.

4. Our teacher does not pay attention to any of our individual needs. He is interested only in the subject he is teaching. Sometimes we do "busy work" that has little meaning to us.

5. Our teacher ignores us as individuals. He thinks only of learning the subject. Every student must learn the same things. We do "busy work," and we usually do work from the textbook.

C. How does your teacher feel about students?

1. Our teacher looks at us the way we really are. He is friendly and understanding. He likes us and enjoys having us around. He listens to our opinions.

2. Our teacher understands that we are able to learn and grow up but does little to help us. He seems to want to know us better.

3. Our teacher often does not try to understand our feelings or opinions. He thinks we "just need to grow up." He usually grades us by what adults can do rather than by what we can do.

4. Our teacher thinks of us as "little adults," not as teenagers. He tends to expect too much or too little of us.

5. Our teacher does not try to understand us. He is not interested in the opinions of teenagers. He is often ill at ease or uncomfortable when we are with him.

D. How does your teacher understand students who have behavior problems?

1. Our teacher is not as worried about students who misbehave in class as he is about students who are "too quiet." He tries to figure out why students do certain things and to help them solve their problems.

2. Our teacher is aware that students have problems. He looks for reasons why students misbehave. He expects students to behave even if they have problems, and he will punish them if he has to.

3. Our teacher usually is not aware that students have reasons for doing the things they do. He knows he should learn something about the background of his students, but he often punishes instead.

4. Our teacher is not aware that students have problems. He treats all students who misbehave the same way. He always punishes them.

5. Our teacher thinks students who do not obey are the most serious problems. He thinks the shy, quiet students are the "perfect students." He does not try to understand why students act the way they do. He punishes all students who misbehave.

E. What do the students think of your teacher?

1. Students can talk freely with our teacher. They like our teacher very much.

2. Students respect and admire our teacher, but they feel uncomfortable when talking to him personally.

3. Most students like our teacher and are willing to do what he wants.

4. Students do not fear our teacher, but they do not respect or like him.

5. Students fear and stay away from our teacher. They might even harm him if they could.

F. What do you do in your science class?

1. We often talk about the problems scientists have in the discovery of a scientific principle. We also talk about the facts behind a scientist's conclusions. If we do not agree with our teacher, he wants us to say so. We often have time to talk among ourselves about ideas in science. We do most of the experiments and demonstrations ourselves.

2. We sometimes talk about the problems scientists have in the discovery of a scientific principle. We also talk about the facts that are behind a scientist's conclusions. We sometimes do experiments and demonstrations ourselves. We can question what our teacher says.

3. We have talked a few times about the problems scientists have in the discovery of a scientific principle. We spend part of our class time answering our teacher's questions. We also write answers to questions from our book or study guides. We do some experiments ourselves.

4. We ask questions to clear up what the teacher or our book has told us. We watch our teacher do demonstrations. We write answers to questions from our book or study guides. We answer our teacher's questions.

5. We must copy down and memorize what our teacher tells us. Most of our questions are to clear up what our teacher or our book has told us. We often write answers to questions from our book or study guides.

G. What does your teacher do in class?

1. Our teacher helps us understand the reason for a lesson before we start it. Our teacher often questions us on ideas we studied earlier. He asks us for the facts behind the ideas in our book. Our teacher often asks us to explain diagrams and graphs.

2. Our teacher often questions us on ideas we studied earlier. He asks us for the facts behind some of the ideas in our book. He sometimes asks us to explain diagrams and graphs.

3. Our teacher spends most of the time telling us about science. He repeats much of what our book says. Our teacher sometimes questions us about ideas we studied earlier.

4. Our teacher sometimes repeats exactly what our book says. If students do not agree, our teacher tells us who is right. Most of the time our teacher tells us about science.

5. Our teacher shows us that science has most of the answers to questions about the natural world. If students do not agree, our teacher tells us who is right. Our teacher often repeats exactly what our book says.

H. How does your teacher use the textbook and reference materials?

1. Our teacher expects us to find the major ideas in our book. We must also find the facts to prove the ideas. He shows us how to question ideas in our book. We often read about science in magazines and other books.

2. Our teacher expects us to learn some of the details in our book. We can use magazines and other books in the room if we want. Our teacher shows us how to question ideas in our book.

3. Our teacher expects us to learn many of the details in our book. We look for some of the major ideas in our book. We also find the facts to prove the ideas. We sometimes outline parts of our book. The only science we talk about is from our book and our teacher's notes.

4. Our teacher expects us to outline part of our book. The only science we talk about is from our book and our teacher's notes. We must learn most of the details in our book.

5. Our teacher does not like us to question information from our book. We often write out definitions to words. We must outline parts of our book. We must memorize most of the details in our book.

I. What are your tests like? How are they used?

1. Our tests have many questions about our laboratory work. We often figure out answers to new problems. Sometimes we find ways of looking for answers to problems. Often we do things we have learned in our laboratory such as making observations and explaining data.

2. Our tests have many questions about our laboratory work. We sometimes figure out answers to new problems. Sometimes we do things we have learned in our laboratory such as making observations and explaining data.

3. Our tests sometimes ask us to label drawings. Our tests sometimes have questions about our laboratory work. Sometimes we must tell about ideas that we learned earlier.

4. Our tests often ask us to write out definitions to words. We do not use mathematics to answer questions on our tests. Often we must label drawings.

5. Our tests often ask us to write out definitions to words. Often we must label drawings. We do not use mathematics to answer questions on our tests. We do not have a chance to talk about the test questions in class.

J. What do you do in the laboratory?

1. We talk about the reasons for an experiment before we do it. We often try our own ways of doing the laboratory work. We compare our answers to those of others when we are finished. We are allowed to do experiments on our own.

2. We talk about the reasons for most experiments before we do them. The data one student gathers from an experiment are often different from the data gathered by another student. We may do some experimenting on our own.

3. We sometimes talk about the reasons for experiments. We sometimes compare our answers to those of others when we are finished. We spend less than one third of our time doing laboratory work.

4. We sometimes know the answer to a question before we do an experiment. We seldom talk about the reason for an experiment. We spend less than one fourth of our time doing laboratory work.

5. We are not allowed to do experiments on our own. We know the answer to a question before we do an experiment. We do not talk about the reasons for an experiment. We spend very little of our time doing laboratory work.

APPENDIX B

STUDENT QUESTIONNAIRE

STUDENT QUESTIONNAIRE

DIRECTIONS: The information from this questionnaire is to be placed into a computer for storage and use. Therefore, the answers to all questions (61-68) must be answered 1,2, or blank on a machine-score answer sheet. Do not write on this questionnaire. A series of eight questions are asked. Place the number that answers the question on the answer sheet you used for the activity checklist you answered earlier. For example, question 61 asks if you like science? If you do not like science, place a pencil mark on the [1] on the answer sheet next to 61; if you like science, place a pencil mark on the [2] on the answer sheet next to 61.

61. Do you like science? No = 1; Yes = 2

62. Do you like this science course? No = 1; Yes = 2

63. Is the student teacher having any influence on your liking or disliking this course? No = 1; Yes = 2

64. If your answer to number 63 was no, leave this question blank; if you answered yes to number 63, is the influence toward disliking = 1 or liking = 2 the course?

65. Does your "regular" teacher (NOT the student teacher) have any influence on your liking or disliking this course? No = 1; Yes = 2

66. If your answer to number 65 was no, leave this question blank; if you answered yes to number 65, is the influence toward disliking = 1 or liking = 2 this course?

67. If a textbook is used in your class, do you like it? No = 1; Yes = 2. If your class does not use a book, leave this number blank.

68. If a laboratory guide or manual is used in your class, do you like it? No = 1; Yes = 2. If your class does not use a laboratory guide, leave this number blank.

APPENDIX C

SUMMARY STATISTICS FOR VARIABLES

1. Means, standard deviations, and number of cases for first professional quarter preservice teacher variables.
2. Means, standard deviations, and number of cases for student teaching quarter preservice teacher variables.

1. MEANS, STANDARD DEVIATIONS, AND NUMBER OF CASES FOR FIRST PROFESSIONAL QUARTER PRESERVICE TEACHER VARIABLES

Appendix D, p. 213 provides a listing of variables by their number and name for use in the interpretation of this appendix.

Variable Number	$\bar{X}$	S.D.	N
1.	44.98	6.48	48
2.	6.44	1.57	48
3.	7.10	1.24	48
4.	6.67	1.23	48
5.	7.25	1.87	48
6.	50.31	5.38	48
7.	50.50	3.94	48
8.	7.13	1.10	48
9.	7.79	1.18	48
10.	7.25	0.79	48
11.	52.38	3.46	48
12.	108.06	8.35	48
13.	70.33	5.24	48
14.	110.15	6.64	48
15.	69.81	5.24	48
16.	73.83	18.20	30
17.	2.98	0.79	44

2. MEANS, STANDARD DEVIATIONS, AND NUMBERS OF CASES FOR STUDENT TEACHING QUARTER PRESERVICE TEACHER VARIABLES

Appendix D, p.213 provides a listing of variables by their number and name for use in the interpretation of this appendix.

Variable Number	Project			Non-project		
	$\bar{X}$	S.D.	N	$\bar{X}$	S.D.	N
1.	1.75	0.44	32	1.72	0.45	36
2.	1.58	0.50	36	1.56	0.50	36
3.	1.52	0.51	33	1.56	0.51	18
4.	1.38	0.49	34	1.37	0.49	19
5.	1.57	0.51	21	1.18	0.40	11
6.	4.63	0.57	46	4.45	0.55	42
7.	4.61	0.80	46	4.31	0.92	42
8.	93.50	47.64	44	68.63	51.93	36
9.	63.05	6.88	40	59.39	8.82	36
10.	21.11	2.47	44	19.51	3.26	37
11.	20.66	2.91	41	18.83	3.87	36
12.	21.21	2.99	43	20.78	2.89	37
13.	61.78	6.57	46	60.32	8.51	38
14.	21.19	3.10	46	19.93	3.36	44
15.	19.69	2.37	46	19.08	3.74	38
16.	20.67	2.27	46	20.41	3.11	46

Variable Number	Project $\bar{X}$	Project S.D.	Project N	Non-project $\bar{X}$	Non-project S.D.	Non-project N
17.	34.67	4.57	37	32.59	3.66	36
18.	50.62	5.09	45	50.41	6.31	46
19.	51.72	5.53	46	51.69	5.75	45
20.	52.51	3.53	45	52.93	7.84	46
21.	53.09	4.09	46	54.89	6.53	45
22.	110.42	6.51	45	112.65	30.32	46
23.	69.80	5.26	45	68.74	7.89	46
24.	109.30	8.03	46	108.15	8.99	46
25.	70.46	5.51	46	70.19	4.72	46
26.	0.13	0.34	46	0.27	0.45	41
27.	38.53	9.65	45	36.74	11.34	39
28.	132.22	34.17	45	132.57	22.33	37
29.	4.29	1.29	44	4.18	1.23	39
30.	4.58	0.62	45	4.62	0.59	39
31.	4.87	0.34	46	4.61	0.89	38
32.	3.85	1.17	46	3.18	1.32	39
33.	0.57	0.50	44	0.45	0.50	38
34.	3.74	1.06	46	3.03	0.96	39
35.	34.91	4.91	34	33.49	4.23	35
36.	39.78	3.23	9	38.50	5.13	6
37.	20.44	1.74	9	19.33	2.88	6
38.	19.78	1.79	9	19.17	2.14	6

Variable Number	Project $\bar{X}$	Project S.D.	Project N	Non-project $\bar{X}$	Non-project S.D.	Non-project N
39.	38.67	5.09	9	37.17	4.96	6
40.	19.56	2.35	9	18.83	2.48	6
41.	19.00	2.92	9	18.33	2.42	6

APPENDIX D

LISTINGS OF VARIABLES

1. Listing of first professional quarter preservice teacher variables
2. Listing of student teaching quarter preservice teacher variables

1. LISTING OF FIRST PROFESSIONAL QUARTER PRESERVICE TEACHER VARIABLES

Variable Number

Science Classroom Activity Checklist: Teacher's Perceptions-Urban, Pretest

1. Composite score
2-5. Subscale A - Subscale D
2 = A, 3 = B, 4 = C, 5 = D

Science Classroom Activity Checklist: Teacher's Perceptions-Urban, Posttest

*6. Composite score

Science Classroom Activity Checklist: Teacher's Perceptions-Suburban, Pretest

7. Composite score
8-10. Subscale A - Subscale C
8 = A, 9 = B, 10 = C

Science Classroom Activity Checklist: Teacher's Perceptions-Suburban, Posttest

*11. Composite score

Cultural Attitude Inventory, Pretest

12. Attitude subscale
13. Knowledge subscale

Cultural Attitude Inventory, Posttest

*14. Attitude subscale
*15. Knowledge subscale

American College Test (A.C.T.)

16. Composite percentile score

Grade Point Average (G.P.A.)

17. Average at beginning of student teaching quarter

*Criterion variables

D. LISTING OF STUDENT TEACHING QUARTER
PRESERVICE TEACHER VARIABLES

Variable Number

Classroom Student Variables
1. Mean class attitude toward science course (like=2, dislike=1)
2. Mean direction of student teacher influence (toward liking=2, toward disliking=1)
3. Mean direction of regular (cooperating) teacher influence (toward liking=2, toward disliking=1)
4. Mean class attitude toward student textbook (not used=blank, like=2, dislike=1)
5. Mean class attitude toward student laboratory guide (not used=blank, like=2, dislike=1)

Student Teacher Variables
6. Attitude toward class (like=5 . . . dislike=1)
7. Attitude toward cooperating teacher (like=5 . . . dislike=1)
8. Minutes of laboratory work per week
9-12. Checklist for Assessment of Science Teachers: Supervisor's Perceptions, completed by the cooperating teacher
9 = Composite score
*10= Subscale A, Student-Teacher relations
*11= Subscale B, Classroom activities
*12= Subscale C, Personal adjustment
13-16. Checklist for Assessment of Science Teachers: Supervisor's Perceptions, completed by the university supervisor
13= Composite score
*14= Subscale A, Student-Teacher relations
*15= Subscale B, Classroom activities
*16= Subscale C, Personal adjustment
*17. Science Classroom Activity Checklist: Student's Perceptions, composite score
18. Science Classroom Activity Checklist: Teacher's Perceptions-Urban, pretest, composite score
*19. Science Classroom Activity Checklist: Teacher's Perceptions-Urban, posttest, composite score
20. Science Classroom Activity Checklist: Teacher's Perceptions-Suburban, pretest, composite score
*21. Science Classroom Activity Checklist: Teacher's Perceptions-Suburban, posttest, composite score
22. Cultural Attitude Inventory, Attitude subscale, pretest
23. Cultural Attitude Inventory, Knowledge subscale, pretest
*24. Cultural Attitude Inventory, Attitude subscale, posttest
*25. Cultural Attitude Inventory, Knowledge subscale, posttest

Cooperating Teacher Variables
26. Sex of cooperating teacher (male=0, female=1)
27. Age of cooperating teacher (years)
28. Total number of students taught per day
29. Number of classes of primary subject taught
30. Attitude toward class (like=5 . . . dislike=1)
31. Attitude toward teaching science (like=5 . . . dislike=1)
32. Attitude toward student text (like=5 . . . dislike=1)
33. Use of curriculum project materials (yes=1, no=0)
34. Attitude toward laboratory facilities (excellent=5 . . . non-existent=1)
35. Science Classroom Activity Checklist: Student's Perceptions, composite score

Pilot Variables
36-38. Checklist for Assessment of Science Teachers: Pupil's Perceptions in terms of the student teacher
36= Composite score
37= Subscale A, Student-Teacher relations
38= Subscale B, Classroom activities
39-41. Checklist for Assessment of Science Teachers: Pupil's Perceptions in terms of the cooperating teacher
39= Composite score
40= Subscale A, Student-Teacher relations
41= Subscale B, Classroom activities

Descriptive Variables
1. Preservice teacher mean age
2. Preservice teacher mean sex
3. Preservice teacher mean grade point average
4. Cooperating teacher mean age
5. Cooperating teacher mean sex
6. Cooperating teacher mean total years of experience
7. Cooperating teacher mean total number of students per day
8. Cooperating teacher mean number of classes in primary assignment
9. Mean class size by FABC levels
10. Frequency of schools by FABC levels
11. Frequency of classes by grade level
12. Frequency of classes by science area
13. Frequency classes by use of curriculum project materials

*Criterion variables

APPENDIX E

ANALYSIS OF VARIANCE OF VARIABLES MEASURED FOR TWO CLASSES

1. Analysis of variance of randomly selected project and non-project classes on six variables measured for two classes.
2. Analysis of variance of twelve selected project and non-project classes on the CAST:PP measured for two classes.

1. ANALYSIS OF VARIANCE OF RANDOMLY SELECTED PROJECT AND NON-PROJECT CLASSES ON SIX VARIABLES MEASURED FOR TWO CLASSES[a]

Variables	Class 1 $\bar{X}$	Class 1 S.D.	Class 2 $\bar{X}$	Class 2 S.D.	P less than
1. Direction of student teacher influence	1.83	0.41	1.67	0.52	0.5
2. Student attitude to textbook	1.83	0.41	1.50	0.55	0.26
3. Minutes of laboratory work per week	106.67	65.09	106.67	65.09	1.00
4. SCACL:SP on student teacher	36.33	6.47	35.33	3.62	0.75
5. Cooperating teacher attitude to class	4.67	0.52	4.17	0.98	0.29
6. SCACL:SP on cooperating teacher	36.67	3.27	38.33	3.98	0.45

[a]N = 6 observations per cell
Multivariate Analysis of Variance (Poor and Rosenblood, 1971)

2. ANALYSIS OF VARIANCE OF TWELVE SELECTED PROJECT AND NON-PROJECT CLASSES ON THE CAST:PP MEASURED FOR TWO CLASSES[a]

	Variables	Class 1 $\bar{X}$	Class 1 S.D.	Class 2 $\bar{X}$	Class 2 S.D.	P less than
1.	Composite score on student teacher	38.83	4.17	38.08	4.66	0.68
2.	Subscale A on student teacher	19.67	2.31	19.33	2.87	0.76
3.	Subscale B on student teacher	19.42	1.93	18.75	2.34	0.45
4.	Composite score on cooperating teacher	38.08	4.68	38.42	4.50	0.86
5.	Subscale A on cooperating teacher	19.33	2.19	19.25	2.42	0.93
6.	Subscale B on cooperating teacher	18.75	2.67	19.08	2.61	0.76

[a]N = 12 observations per cell
Multivariate Analysis of Variance (Poor and Rosenblood, 1971)

APPENDIX F

DESCRIPTION OF THE 1970-71 SENIOR PROJECT SCIENCE TEACHER EDUCATION PROGRAM

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General Description of First Professional Quarter (S_1) Program

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The influence of contrasting communities and differing grade levels on teaching and learning in secondary schools.

A problem solving stance toward pedagogical problems in science education.

The nature of science to be considered in developing student activities.

Objectives

The S_1 student will:

1. Develop an understanding of the underlying cultural elements characterizing urban, suburban, and rural areas and their impact on the schools.
2. Develop a sensitivity to the differences in cultural backgrounds of students and the effects of these differences on learning.
3. Re-examine similarities and differences between junior and senior high school students and the educational programs offered to each.

4. Acquire understanding of the origin and nature of the charge made by some critics that the public school system is racist and irrelevant and does not meet the needs of groups such as inner-city blacks.
5. Acquire a sense of the political workings and functionings of a science department, a school, and a school system.
6. Become more aware of the nature of good teaching and the characteristics of "good teachers" as perceived by high school students.
7. Acquire skills and insights into using the nature of science as a guide and tool in planning student activities.
8. Develop insights and skills involved in long and short term planning for teaching.
9. Acquire insight regarding how students' cultural backgrounds and learning capabilities should guide the selection of instructional objectives, activities, materials, and methods.
10. Become able to interpret test scores from teacher made and standardized tests, apply statistical techniques to test construction and use this information to improve the teaching-learning situation.
11. Become able to analyze a video-tape or audio-tape of his teaching to gain insight into his verbal and nonverbal teaching behavior. Demonstrate the ability to

evaluate his teaching performance.

12. Explore the possibilities of working in "teaching teams."

13. Gain a spirit of professionalism which includes striving for considered changes and improvements.

Program

S_1 students will be assigned in pairs to work with cooperating teachers as teaching assistants for four weeks in an inner-city school and four weeks in an outer-city school. The S_1 students will be able to provide considerable help as junior members of "instructional teams." They can prepare and conduct demonstrations, assist in laboratory work, prepare guidesheets or other instructional materials, assist in evaluating pupil progress, and work with individuals and small groups in need of special help. In addition each S_1 student will get an opportunity to teach an entire class several times during his four weeks of heavy involvement in each school.

Seminars which focus on understanding school based experiences in a framework of principles, practices, and philosophies of secondary education will be held twice a week. In addition to the seminars there will be regular classwork in philosophy and/or sociology of education. S_1 students will also continue to study special methods of teaching science and develop instructional materials which they can use